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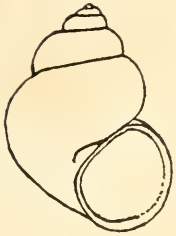

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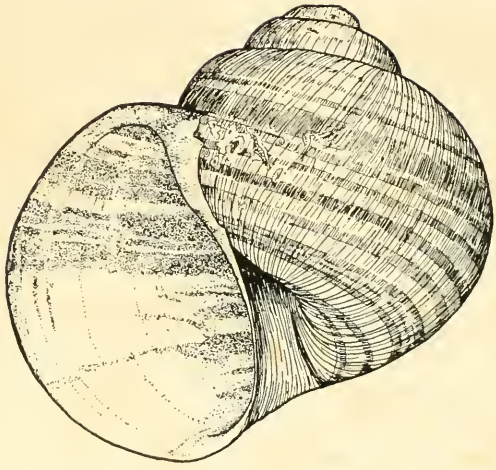

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THE NAUTILUS.

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MALACOLOGICAL NOTES FROM THE AMAZON RIVER, BRAZIL

BY J. BEQUAERT

Department of Tropical Medicine, Harvard Medical School

The mollusks listed below were obtained during a recent trip to the Amazon country (July to September, 1924) as a member of the Third Hamilton Rice Expedition, in conjunction with the Department of Tropical Medicine of Harvard Medical School. The specimens were all identified by Dr. H. A. Pilsbry, whom I wish to thank most heartily for his help.

Only the lowland country was visited. Among the localities mentioned, Belem, Pará and Manáos are well known. The others are mostly in the State of Amazonas: San Francisco is on the left bank of the lower Rio Negro, in about 2° S. and 61° W.; Carvoeiro and San Alberto are on the same river, but near the confluence of the Rio Branco, in approximately 1° 30′ S. and 62° W., the former on the right bank and the latter on the left bank; Santa Maria is on the left bank of the lower Rio Branco, in about 0° 45′ S. and 62° W.

Streptaxis glaber Pfeiffer. Santa Maria, many dead specimens of normal size. Carvoeiro, one live specimen of a much smaller form. Manáos, very many living specimens of the small form, only about half the size of those of Santa Maria.

Gulella bicolor (Hutton). A few dead specimens were found

at Manáos. This species, originally described from the Seychelles, was evidently introduced by man into Brazil.

Bulimulus tenuissimus (d'Orbigny). This was found in abundance at Belem, Pará, on low herbs and grass in the central square of the town; young, living specimens were also taken at Carvoeiro. Fred Baker has listed it previously from Pará and Itacoatiara in the Amazon Basin.

Subulina octona (Bruguière). Manáos, many living specimens. Carvoeiro, abundant. Santa Maria, many dead specimens. This species, though apparently indigenous to tropical America and Africa, has been widely spread by man.

Opeas gracile (Hutton). Manáos, many specimens, some of them alive. Carvoeiro, many, but all dead. Though this species has been scattered by man throughout the tropics, it has as yet been recorded from two African localities only.

Opeas beckianum (Pfeiffer). Manáos, a few specimens, some of them alive.

Opeas pumilum (Pfeiffer). Carvoeiro, a number of dead specimens.

Leptinaria lamellata (Potiez and Michaud). Manáos, one dead specimen. Carvoeiro, abundant and alive. San Alberto, living specimens under rotting leaves of bananas in an abandoned plantation.

Leptinaria lamellata concentrica (Reeve). Santa Maria, one dead specimen.

Leptinaria n. sp. Carvoeiro, several living specimens.

Succinea manaosensis Pilsbry. This was found in abundance in a garden at Manáos, but no living examples were seen.

Ampullarius olivaceus (Spix), variety. One large, adult specimen was found dead at San Francisco in a low, swampy patch of forest near the shore of the Rio Negro.

Ampullarius sp. (near *metcalfei* Reeve). Numerous immature specimens from Manáos, where they are abundant in flooded excavations of the unfinished harbor works. No full-grown examples were seen.

Hyria corrugata Lamarck. Several examples were bought in the market at Belem, Pará, and were said to have been taken from one of the branches of the Pará River.

Prisodon syrmatophorus (Meuschen). This was bought in the market at Belem, Pará, with the foregoing and probably came from one of the rivers in the vicinity

Anodontites trapesialis (Lamarck), var. Two examples were given to me by Mr. P. Le Cointe, who obtained them on the shores of the Terra Santa Lake, near the right bank of the Amazon River, east of Faro, in about 2° 10′ S. 56° 45′ W.

The malacologist who visits the tropics for the first time expects to be overloaded with material, but if he must restrict his researches to the lowlands he is usually quite disappointed. In the moist forests there are but few large and showy forms, the remainder being never numerous in individuals and quite well hidden. In the open savanna country the rank and dense grass renders researches still more tedious in the wet season, while during the drought most species are aestivating deep in the ground or in crevices of rocks or trees. Ecological conditions are evidently quite uniform in the tropical lowlands over large areas; furthermore, certain factors, such as the extensive flooding of the forest near the banks of the rivers and the scarcity of lime in the soil, are decidedly adverse to terrestrial snail life. I have found in Africa that the mountains are malacologically much richer, especially where they are covered with dense forests; not only are the rocks more varied, but altitude produces a series of life zones, while the exposure of the slopes further modifies environmental conditions. Thus in the Belgian Congo a quite narrow mountainous strip along the eastern border has yielded more species of land mollusks than the remainder of the territory. I suspect that the same rule might hold true for South America, although I have had no occasion to visit the mountains of that continent.

Only on two occasions during my trip to Brazil did I find mollusks in fair abundance of species and individuals. The seven land shells listed above from Manáos, including the *Succinea*, were obtained from a small garden adjoining Dr. H. W. Thomas' Medical Laboratory, where they were aestivating between stony débris and in the crevices of the walls. Many specimens of *Veronicella* were found with them. The spot was very dry, as we had but a few, short rain showers during the

three weeks of our stay at Manáos (end of July and beginning of August). In the same garden I found a number of living, small, bulimulid snails, which can not be identified as the specimens have been mislaid; they were solidly fixed with the aperture to the under side of the leaves or more rarely to the thin twigs of a guava tree and covered all over with a coating of dirt (perhaps excremental matter of the snail). On the journey up the Rio Negro rains were frequent so that conditions were more favorable for snail life. At Carvoeiro eight species of snails and a *Veronicella* were taken in large numbers crawling over rubbish in waste places within the town. They included not only a new species of *Leptinaria*, but also a minute pupillid not listed here, which was especially abundant on decaying bones. *Bulimulus tenuissimus* (d'Orbigny) may further be mentioned as the host of a parasitic fly of the family Sarcophagidae (*Malacophagula neotropica* J. Bequaert), the maggot of which appears to attack the live and healthy snail, as the European *Melinda cognata* (Meigen) is know to do with certain Helicidae.

Fresh-water mollusks were surprisingly scarce. Only immature specimens of *Ampullarius* were seen at Pará and Manáos. No Planorbidae nor Physidae were found, although special search was made for these snails which are of considerable sanitary importance as intermediary hosts of parasitic worms. In this connection I may call attention to a paper by Dr. A. da Matta, a copy of which I owe to the generosity of the author.[1] No species of *Planorbis* was found by him at Manáos. So far as I can discover, the only planorbid known with certainty from the forested lowlands of the Amazon is *P. anatinus* d'Orbigny which was taken by F. Baker (with *Physa rivalis*) in an artificial lake in the park in front of the Cathedral of Pará. Planorbidae, however, are common in many parts of the drier, savanna country, in Venezuela, as well as in southern and eastern Brazil. I have made analogous observations in Africa, where the Planorbidae and Lymnaeidae are quite abundant in the savanna

[1] A. da Matta. Malacologia medica. Notas sobre a geographia sul-americana do molusco Planorbis e provavel disseminaçao da Schistosomose hepato-intestinal. Amazonas Medico (2), II, No. 8, 1919, pp. 179–184.

country, but generally avoid the forest belt of the lowlands. In the rain forest they are, with very few exceptions, only met with in ponds and ditches near human settlements.

The two unionids (*Hyria* and *Prisodon*) were obtained in the market at Pará, where they were offered for sale as a local remedy against eye sore; the pearly inside of the mussel being scraped off and mixed with water.

NEW SPECIES OF FRESH-WATER OPERCULATES

BY BRYANT WALKER

I

LANISTES PILSBRYI n. sp. Pl. 1, fig. 1.

Shell large, thin, globose-conic, umbilicate; whorls about six, the last greatly inflated, flattened and obtusely shouldered above, rounded below and without any angulation around the umbilicus; spire conic, obtuse and with a sharp carina on the shoulder of the two apical whorls; yellow with many spiral bands of greenish-brown, wider and more numerous on the upper part of the whorl, apical whorls dark brown; surface smooth with fine, regular lines of growth and covered with a minute, close, somewhat irregular spiral sculpture, scarcely visible to the naked eye, which as it cuts the lines of growth gives a granular appearance to the surface when examined under a glass; aperture large, a little oblique, suboval, wider below, interior white showing the color bands; lip sharp, quite regularly rounded on the outer margin, drawn back and only slightly curved on the inner. Operculum unknown.

Type (apex eroded) alt. 62, major diam. 64.4, minor diam. 50.3; aperture alt. 49, diam. 35.1 mm. An immature shell with five whorls and a perfect apex measures, alt. 43.2, major diam. 38.4, minor diam. 35.3 mm.

Type locality, So River, Ebolowa, Cameroon.

Types No. 73451, Coll. Walker. Paratype in the collection of the Philadelphia Academy.

MARINE BIOLOGICAL LABORATORY WOODS HOLE LIBRARY MASS.

This fine species is more nearly related to *L. intortus* Lam. which also occurs at Ebolowa than to any other, but differs in being nearly twice as large and in the greater development of the spiral sculpture.

As shown by the figure the upper whorls of the type are entirely eroded, the description of the apical whorls is drawn from the smaller specimen indicated above, the description is therefore a composite one.

I take pleasure in naming it after Dr. H. A. Pilsbry, who has kindly compared the cotypes with the other species of *Lanistes* in the collection of the Academy.

I am also indebted to Miss Mina L. Winslow of the Museum of Zoology, University of Michigan, for the admirable drawing of the type.

II

Amnicola winkleyi mozleyi n. v. Pl. 1, figs. 2–3.

Shell ovate-conic, umbilicate; whorls five, very convex, the penultimate roundly shouldered; suture deep; bleached white; growth lines scarcely visible; apex small, acute and projecting; aperture broad ovate; peristome continuous, shortly appressed to the parietal wall.

Length (fig. 2, male) 4.6, diam. 3.5, length of aperture 2.25 mm.

Length (fig. 3, female) 4.25, diam. 3.5, length of aperture 2.25 mm.

Type locality. A clay bank, Winnipeg, Manitoba.

Types No. 81978 Coll. Walker. Paratypes in the collections of Alan Mozley, The Philadelphia Academy and the University of Illinois.

This form is closely related to *A. winkleyi* Pils., but differs in being a little longer and much more inflated, the roundly shouldered penultimate whorl is characteristic, the umbilicus is larger and the apex more acute.

It is quite different from *A. winkleyi leightoni* Baker, which has the last whorl more depressed, a wider umbilicus and lacks entirely the shouldered penultimate whorl.

Whether it should be considered a distinct species, closely related to *winkleyi* or attached to it as a variety is largely a matter of individual opinion, but on the whole the conservative view seems more advisable.

As usual in the *Amnicolidæ* there is a considerable difference in the amount of inflation, as shown by the figures, which is probably sexual.

Named after the collector, Mr. Alan Mozley.

I am indebted to both Dr. Pilsbry and Mr. F. C. Baker for assistance in determining its systematic position.

III

AMNICOLA (ALOCINMA) ANNANDALEI n. sp. Pl. 1, fig. 4.

Shell ovate-conic, rimate; whorls 4.5, strongly convex; suture deeply impressed; greenish corneous, darker above and becoming nearly white in the umbilical region; surface smooth, polished and with very delicate lines of growth; apex rather acute; aperture ovate, rounded above and nearly vertical; peristome continuous, slightly thickened throughout, the outer margin somewhat doubled, the inner layer forming a ledge for the reception of the operculum, which can not be withdrawn into the aperture, the inner closely appressed to the body-whorl its entire length; columella a little incurved. Operculum ovate, semi-transparent, broadly rounded below and bluntly pointed above, concentric, with a small, spiral, subcentral nucleus, which is nearer to the inner than to the outer margin.

Length 4.5, width 3 mm. Operculum length 2.25, width 1.5 mm.

Type locality, Taichu Province, Formosa.

Type No. 80026 Coll. Walker. Paratype in the Indian Museum, Calcutta.

A few specimens of this species were found in a sending o *Blanfordia formosana* P. & H. Not being able to approximate it to any of the described species, a specimen was sent to the late Dr. N. Annandale of the Indian Museum, Calcutta, who pronounced it to be undescribed, and I take great pleasure in associating his name with it.

The subgenus *Alocinma* was established by Annandale and Prashad in 1919 (Rec. Ind. Mus., XVIII, p. 25) for the reception of a small group of Indian species, which in the characters of the shell and radula are similar to *Amnicola, s.s.*, but differ in having a thick, calcareous, subhyaline operculum with a small, spiral nucleus.

The present species is more elevated than its congeners and in general shape resembles the *A. winkleyi* Pils., of New England.

As usual in the *Amnicolidæ*, some of the specimens are more obese than the type (a male?) and probably represent the female phase.

IV

PALUDESTRINA BOTTIMERI n. sp. Pl. 1, fig. 5.

Shell minute, oblong-conic, perforate; whorls four, not much inflated, body-whorl large, equalling $\frac{3}{4}$ of the length, its sides somewhat flattened, nearly parallel; suture impressed; greenish horn-color; surface smooth, lines of growth scarcely visible; apex obtuse, the apical whorl scarcely projecting above the second; aperture oval, rounded below and angled above; peristome sharp, continuous, the upper part appressed to the parietal wall.

Length 2, diam. 1.25 mm.; aperture length 1, diam. 75 mm.

Type locality, Glen Echo, Montgomery Co., Md.

Type No. 82099 Coll. Walker. Paratypes in the collections of W. J. Clench and L. J. Bottimer.

This little species, one of the smallest of the Eastern American *Paludestrinæ*, differs from the recently described *P. truncata* Van. in its smaller size, more inflated shape and obtuse, entire apex.

I am indebted to Mr. Clench for the opportunity of describing the species and at his request have named it after the discoverer, Mr. Bottimer.

NOTES ON WEST COAST CALYPTRAEA

BY A. M. STRONG

Recent lists and papers on West Coast shells include many changes in names from the generally accepted usage. It is to be presumed that the authors have had good reasons for these changes though in but few cases has the reason been given. Without some statement of the name under which the shell has ordinarily gone or reference to the authority for the new name the collector who wishes to keep his records up to date is forced to do a good deal of research work. These changes result in different sets of the same shell being found in collections from different localities under different names. A case in point is the Calyptraeas of the West Coast. Specimens of the three northern forms are to be found in the collections variously labeled *C. mamillaris* Brod., *C. fastigiata* Gld., *C. contorta* Cpr., and under such combinations as *C. fastigiata* var. *mamillaris* Brod., and *C. mamillaris* var. *contorta* Cpr.

Keep's West Coast Shells gives only *C. mamillaris* Brod. and states the range as Puget Sound to Central America. Williamson's List of Shells from San Pedro in Proc. U. S. Nat. Mus., vol. 15, lists *C. mamillaris* Brod. and states "= *Calyptraea fastigiata* Gld., (?) = *Galerus contortus* Cpr." The same statement appears in Arnold's Paleontology of San Pedro. Tryon's Manual of Conchology describes *C. mamillaris* Brod. and lists the following names in the synonymy: *C. regularis* C. B. Adams, *aspersa* C. B. Adams, *lamarckii* Mke., *lorica* Brod., *lichen* Brod., *unguis* Brod., *fastigiata* Gld., *solida* Rve., *poculum* Rve., *clypeolum* Rve., *fusca* Cpr., and *magellanica* Gray. The range is given as Puget Sound to South America. The only mention of *C. contorta* Cpr. in Tryon is in the list of shells which have not been seen.

Dr. Dall in his Peruvian Fauna, Proc. U. S. Nat. Mus., vol. 37, gives *C. mamillaris* Brod. and *C. lichen* Brod. as the two species of the Peruvian Province, and states that *C. unguis* Brod. is a young Trochita. In Bulletin 112 he gives *C. fastigiata* Gld. as ranging from Alaska to Puget Sound and *C. contorta*

Cpr. as ranging from Catalina Islands to the Gulf of California. No mention is made of *C. mamillaris* Brod. occurring from San Diego northward. Mrs. Oldroyd's recent list of Puget Sound Shells gives *C. fastigiata* Gld. as found, while Olsson in NAUTILUS, vol. 38, p. 125, lists *C. mamillaris* Brod. from Salinas, Ecuador. These later uses of the name would seem to be in part at least a return to Carpenter's separations.

In Mazatlan Catalogue, No. 333, Carpenter treats quite extensively of *Galerus mamillaris* Brod. and gives in the synonymy "+ *regularis* C. B. Adams, = *lamarckii* Mke." He states "the form *G. lichen* is probably only a flattened variety of this species; but may be distinct. The *C. mamillaris* of d'Orb. (the South American shell) is the *C. unguis* of Brod. and appears to be a distinct species of which *C. sordida* of Brod. is probably a variety." Later in his Supplemental Report, 1863, he recognizes *C. fastigiata* Gld. from Puget Sound as distinct but "like mamillaris", and gives us a new species *C. contortus*, Monterey to San Diego. The latter was fully deseribed in the Proc. Cal. Acad. Sci., vol. 3, p. 215.

Carpenter based his distinctions between the three North American forms mainly on the character of the apex. Of *C. mamillaris* Brod. he says, "The vertex is about .02 across, generally rather separated from the shell, and of an elegant discoidal shape like Planorbis, displaying the whorls and sunken apex." As to color and size he says, "The color is often of a rich brown within and near the vertex; otherwise of a dingy white. Epidermis very thin. An extraordinarily large one measures, long. 1.26, lat. 1.23, alt. 0.56." Gould's description of *C. fastigiata* calls for a shell with "apex central, acute, the spire composed of three flattened whorls—covered with a thin pale-yellow epidermis, interior white. Diameter $\frac{1}{2}$, alt. $\frac{5}{8}$ inches". Carpenter says of the species, "nucleus large, immersed". *C. contorta* is described by Carpenter as a white shell with "whorls twisted, nucleus minute, prominent." It is also much smaller, "long. 0.26, lat. 0.24, alt. 0.15."

Several hundred specimens have been examined which were recently dredged off the coast of Los Angeles County. All are white, with a shining white interior, and a minute prominent

elevated apex. The largest is only 7 mm. in diameter and they answer in every way to Carpenter's description of *C. contorta.* A number of specimens from Magdalena Bay have been examined. They were received as *C. contorta* Cpr. but have brown interiors and are over an inch in diameter. The apex is too worn to be sure of its characteristics but they would seem to answer to Carpenter's description of *C. mamillaris* Brod. and are identical with specimens so labeled from the Gulf of California. Arnold's specimen from the Pleistocene of San Pedro, diam. 33, alt. 7 mm. would seem to be the same. However a number of specimens from the Pleistocene of the Santa Monica Hills all have the small size and minute elevated apex of *C. contorta* Cpr.

Any attempt to fix range limits for these three species will have to wait for further data. *C. fastigiata* Gld. is the species of the Puget Sound District, *C. contorta* Cpr. of the Santa Barbara Channel. There may be some question as to the proper application of *C. mamillaris* Brod. to both the Gulf of California and South American forms. With the exception of *C. lichen* Brod. the southern species formerly placed in the genus are now referred to the genus Cheilea.

A SHORT LIST OF LAND AND FRESHWATER MOLLUSKS FROM SOUTHEASTERN TEXAS

BY WILLIAM J. CLENCH
University of Michigan

The following list is based upon a small collection of mollusks sent to me by L. J. Bottimer of Liberty, Texas. I am indebted to Dr. Bryant Walker for many of the determinations:

Helicina orbiculata tropica Pfr. Lake Charlotte, Chambers Co., Texas. "Under drift along lake." Victoria, Victoria Co., Texas. "On trees, fences, weeds, etc."

Praticolella berlandieriana (Moric.). Victoria, Texas. A little heavier than usually, and faintly banded.

Polygyra espiloca Bld. Liberty, Liberty Co., Texas. "Under logs on damp soil at edge of swamp."

Polygyra thyroides Say. Beaumont, Jefferson Co., Texas. Victoria, Texas. "On trash at base of trees near Guadalupe River." Considerable variation in the extent of lip folding over the umbilical orifice.

Polygyra monodon friersoni Pils. Lake Charlotte, Texas. "Under drift along shore of lake." Liberty, Texas. "Under logs in brushy woods."

Bulimulus dealbatus mooreanus W. G. Binn. Victoria, Texas. "Dead on ground."

Strobilops labryinthica texasiana P. & F. Dayton, Liberty Co., Texas. "In decaying vegetation."

Gastrocopta contracta Say. Dayton, Liberty Co., Texas. "In decaying vegetation in axis of leaves of cabbage palmetto."

Euglandina singleyana W. G. Binn. Victoria, Texas. "Under logs and drift along Guadalupe River."

Carychium exiguum (Say). Dayton, Texas. "In decaying vegetation."

Planorbis lentus Say. Moss Bluff, Liberty Co., Texas. "Edge of marsh."

Segmentina obstructa (Morelet). Moss Bluff, Texas. "Under logs along old canal."

Physa anatina Lea. Liberty, Texas. "On mud and vegetation of small pond." Cleveland, Liberty Co., Texas. Liberty, Texas. "Small pond formed by sulphur well."

Physa halei Lea. Moss Bluff, Texas. "Along old canal.' Lake Charlotte, Texas. "On mud along edge of lake."

Amnicola emarginata (Kust.). Lake Charlotte, Texas.

Amnicola peracuta P. & W. Liberty, Texas. "Edge of small pond in woods."

Rangia cuneata Gray. Lake Charlotte, Texas. "In mud, 1–2 feet of water." Two unusually large specimens.

Carunculina texasensis (Lea). Devers, Liberty Co., Texas. "In mud in shallow ditch."

Musculium transversum Say. Lake Charlotte, Texas. "Screening mud at edge of lake."

NOMENCLATURE OF VERONICELLIDAE (VAGINULIDAE)

BY H. BURRINGTON BAKER

During an attempt to identify certain Venezuelan species, the writer became interested in the classification of this family. Through the generosity of Dr. Pilsbry, he has been given permission to examine the specimens from North America in the Academy of Natural Sciences of Philadelphia, and hopes to present the results in a future paper.

While engaged in this work, a series of papers by Drs. Grimpe and Hoffmann (1924, 1925) added considerably to our knowledge of the morphology of this group. Unfortunately, these helpful monographs are marred by a haphazard disregard for the Law of Priority and by a propensity to consider genus and species as almost equivalent terms.

As a matter of fact, the following group-names have been proposed in the Veronicellidae:

Veronicella Blainville (1817, Jour. Phys. LXXXV, 440, figs. II–4), monotype *V. laevis* Blainv. (l. c.), habitat unknown to its author but actually Jamaica.

Veronicellus Férussac (1819, Hist. II, 51, 83), substitute for *Veronicella*, same type.

Vaginulus Fér. (1821, Tabl. Syst., 13), electotype of Gray (1847, P. Z. S. XV, 178) *Limax nudus* Sloane (1725, Hist. Jam. II, 190, fig. ccxxxiii–2, 3) = *Onchidium sloanii* Cuvier (1816, Reg. An. II, 411),[1] from Jamaica. Electotype of Stoliczka (1873, Jour. As. Soc. Bengal XLII, pt. II, 35) *V. taunaysi* = *Vaginulus taunaisii* Fér. (1821, 13), from Brazil.

Vaginula Blainv. (1828, Dict. Sci. Nat. LVI, 428), substitute for *Vaginulus*, same type. Not *Vaginula* Sowerby (1833, Gen. Shells, fasc. 39, fig. 5).[2]

Imerinia Cockerell (1891, P. Z. S., 219), defined without

[1] Attention is called to fact that Cuvier actually cited figs. cclxxiii–1, 2 of Sloane; these represent species of lizards.

[2] Hoffmann (1925, Jena. Zeitschr. LVI, 172) gives 1820 as the date and then disregards the name.

species; Ckll. and Collinge (1893, The Conch. II, 195), monotype *Vaginula grandidieri* Crosse and Fischer (1871, J. de C. XIX, 331), from Morondava, Madagascar. Not *Imerina* Ragonot (1890) nor *Imerinus* Gahan (1890).

Vaginina Simroth (1897, S. B. Nat. Ges. Leipzig, 1895–6, 154), defined without species. Type now chosen *Vaginina conradti* Simr. (1913, Voeltzkow, Reis. Ostafrika, III–III, 193), from Bismarckburg, Togo, West Africa.

Pseudoveronicella Germain (1908, Bull. Mus. Hist. Nat. Paris XIV, 59), monotype *Veronicella gravieri* Germain (1908, 55), from San Thomé.

Vaginulopsis Simroth (1912, Bronn. Klas. Ord. Thier. III–3, 513), no species; substitute for *Vaginina*, same type.

Pleuroprocta Simroth (1913, 130, 191), type by absolute tautonymy *Vaginula pleuroprocta* Martens (1877, Monatsb. K. Pr. Ak. Wiss. Berlin 1876, 268), from Aburi, west Africa. Used on p. 202 as a group larger than a genus.

Filicaulis Simroth (1913, 131), type now chosen *Vaginula seychellensis* Fischer (1871, Nouv. Arch. Mus. Hist. Nat. Paris VII, 155), from Mahé, Seychelles.

Drepanocaulis Simroth (1913, 140), type now chosen *Vaginula braueri* Simroth (l. c.), from Silhouette, Seychelles.

Laevicaulis Simroth (1913, 147), electotype of Pilsbry (1919, Bull. Amer. Mus. Nat. Hist. XL, 316), *Vaginula comorensis* Fischer (1883, J. de C. XXXI, 55), from Mayotte, Comores.

Prismatocaulis Simroth (1913, 150), type now chosen *Vaginula voeltzkowi* Simroth (l. c.), from Gross-Comoro.

Spirocaulis Simroth (1913, 153), type now chosen *Vaginula lactea* Simroth (l. c.), from Moheli, Comores.

Flagellicaulis Simroth (1913, 155), type now chosen *Vaginula grossa* Heynemann (1885, Jahr. D. Mal. Ges. XII, 9), from Anjouan, Comores.

Curticaulis Simroth (1913, 159), monotype *Vaginula subaspera* Fischer (1883, 55), from Nossi-Comba, near Madagascar.

Rhopalocaulis Simroth (1913, 164), type now chosen *Vaginula grandidieri* (C. and F.).

Annulicaulis Simroth (1913, 187), electotype of Pilsbry (1919, 317), *Vaginula kitotoensis* Simroth (l. c.), from Kwa-Kitoto, east Africa.

Drepanoprocta Simroth (1913, 202), *Pleuroprocta* s. s., same type.

Cycloprocta Simroth (1913, 202), defined without species; type now chosen *Veronicella gravieri* Germain.

Mesoprocta Simroth (1913, 202); group larger than a genus.

Desmocaulis Simroth (1913, 202), type now chosen *Vaginula subaspera* Fischer.

Eleutherocaulis Simroth (1913, 202), type indicated by Pilsbry (1919, 316), *Vaginula comorensis* Fischer.

Flagellocaulis Simroth (1913, 203), misspelling of *Flagellicaulis*, same type.

Vaginopsis "Simroth" Colosi (1922, An. Mus. Nac. Hist. Nat. Buenos Aires XXXI, 482), misspelling of *Vaginulopsis*, same type.

Latipes Colosi (1922, 486), type now chosen *Vaginula pterocaulis* Simroth (1913, Mem. Soc. Neuchat. Sci. Nat. V, 316), from Merida, Venezuela.

Phyllocaulis, *Phillocaulis* Colosi (1922, 486), type now chosen *Vaginula borelliana* Colosi (1921, Atti. Soc. It. Sc. Nat. LX, 156), from Tucuman, Argentine.

Monocaulis Colosi (1922, 486), type now chosen *Vaginula pterocaulis* Simroth. Not *Monocaulos* Allman (1864).

Angustipes Colosi (1922, 486), type by absolute tautonymy *Vaginula angustipes* Heynemann (1885, 276), from Taguara, Brazil. As Colosi did not definitely include this species, I now choose as type *Vaginula difficilis* Colosi (1921, 158), from Tucuman, Argentine.

Meisenheimeria Grimpe and Hoffmann (1924, Zool. Anz. LVIII, 177), authors' type *Vaginula frauenfeldi* Semper (1885, Reis. Arch. Phil. II–III, 324), from Madras, India.

Semperula G. and H. (1924, 177), authors' type *Vaginula idae* Semper (1885, 321), from Borneo.

Sarasinula G. and H. (1924, 177), authors' type *S. plebeja* = *Vaginulus plebeius* Fischer (1868, J. de C. XVI, 145), from New Caledonia.

Vanigula G. and H. (1924, Nova Caledonia III, 387), authors' type *Veronicella bleekerii* Keferstein (1865, Zeit. Wiss. Zool. XV, 118), from Java.

Cylindrocaulus Hoffmann (1925, Jena. Zeitschr. LXI, 141). Not *Cylindrocaulus* Fairmaire (1880, Le Nat. II, 164).

Phyllocaulus Hoffmann (1925, 163), type now chosen *V. borelliana* Colosi.

Belocaulus Hoffmann (1925, 198), type now chosen *Vaginula angustipes* Heynemann.

Despite Blainville's error (later corrected) in regard to the presence of a shell, *Veronicella laevis* is fully as well characterized as are most of the older species. Also, Cockerell's description (1893, 218) of the type in the British Museum certainly agrees very well, in size, extrusion of penis and presence of an abnormal (anal?) opening, with Blainville's original figure and definition. In addition, as Cockerell is the only recent authority who has studied the Jamaican species in the field, there seems every reason to accept his identification of *V. laevis*. For these reasons *Veronicella* should remain as a valid genus, with *Cylindrocaulus* as a preoccupied synonym.

Dr. Cockerell has kindly sent me some of his Jamaican material of this species, and I hope to present additional details of the anatomy in the near future. At present, it will be sufficient to state that *V. laevis* (= *sloanii*) combines a rather long, quite simply acrocaul, cylindrical "penis" (or better verge) with Hoffmann's (Text fig. 19–a) first type of bursa. It is evident that the latter author had no specimens of this species, but I cannot understand why he disregarded Leidy's and Simroth's correct figures of somewhat similar arrangements in *V. floridana* and *V. moreleti*.

On the other hand, the identification of Blainville's species with Sloane's figure, on which *Onchidium sloanii* Cuvier was founded, presents a more difficult question. Férussac (1819, 84) first suggested this identity, which was ratified by Gray (1847, 178) and upheld by Cockerell. In favor of this hypothesis are the facts that the type of *V. laevis* is one of Sloane's specimens and apparently represents the most common Jamaican species.

However, the exceedingly vague figure in the Hist. Jam. scarcely does seem to represent the individual slug described by Blainville and Cockerell. Semper (1885, 296) and Hoffmann,

on the basis of the larger size ($3\frac{1}{2}$ inches) and the more lateral (?) position of the anus, identify Sloane's figure as an apparently distinct species, *Veronicella jamaicensis* Cockerell (1892, Jour. Inst. Jamaica I, 55), which was founded on *Vaginula kraussii* Semper (1885, 314). This species has a similar bursa to the preceding form (*laevis*), but is said to develop lateral wings on the verge; it is *Belocaulus sloanei* (pars) of Hoffmann (1925, 249). In this connection, it must be remembered that Sloane described the living animal and probably gave its extended dimensions; such a specimen (89 mm. long) would certainly contract to the length given by Cockerell (50 mm.) if dropped into alcohol. Personally, I am inclined to follow Cockerell's determination of *V. sloanii* (+ *laevis*) and *V. jamaicensis*, but, in any case, the validity of *Veronicella* is not affected in the least by the status or application of *Onchidium sloanii*.

Neither of these quite closely related forms have any connection with a third Jamaican species, which Hoffmann confused with the true *sloanii* (+ *laevis*) under a name (*jamaicensis;* 1925; 152, 233) which does not belong to either one of them! This third species is actually the *Vaginula nesiotis* of Simroth (1913, 297), and has Hoffmann's (Text fig. 19–c) third type of bursa.

The second genus in the family is *Vaginulus* Fér., with *Vaginula* as an exact synonym. Gray's choice of Sloane's species as the genotype cannot be accepted, because this form was regarded by Férussac (1821, 7, 14) as a doubtful member of his genus. Stoliczka's designation of the first species, *V. taunaisii*, is a valid selection of type and should stand; this choice was repeated by Cockerell (1891, 218).

If Hoffmann's 9th genus (1925, 250) is accepted, the name should be *Imerinia* Cockerell. Those who believe this is preoccupied by *Imerina* or *Imerinus* can use *Curticaulis; Rhopalocaulis*, *Desmocaulis* and *Sarasinula* would be synonyms of either name.

Continuing to follow tentatively Hoffmann's classification, *Vaginina* becomes the fourth applicable name, and is correctly used for his 5th genus (1925, 239); *Vaginulopsis* and *Vaginopsis* are exact synonyms. However, *Pseudoveronicella* would be the prior name for his 1st genus (1925, 220), with *Pleuroprocta*,

Drepanoprocta and *Cycloprocta* as tentative synonyms. Also, *Filicaulis* must be used for his 3rd genus (1925, 228), with *Drepanocaulis*, *Prismatocaulis*, *Spirocaulis*, *Flagellicaulis*, *Flagellocaulis* and *Vanigula* as synonyms. Similarly, *Laevicaulis* becomes the name of his 2nd genus (1925, 223), with *Annulicaulis*, *Eleutherocaulis* and *Meisenheimeria* as synonyms. In addition, *Phyllocaulis* Colosi is prior to *Phyllocaulus* and is the correct name for Hoffmann's 7th genus (1925, 241), while *Angustipes* (+ *Latipes* + *Monocaulis* + *Belocaulus*) must be used for his 8th genus (1925, 245). Finally, *Semperula* stands as the name of his 10th genus (1925, 254), and seems quite free from incumbrances.

ZALOPHANCYLUS, A FISH VERTEBRA, NOT A MOLLUSK

BY G. DALLAS HANNA

The genus *Zalophancylus* was established in 1912 (Hannibal, Proc. Mal. Soc. Lond., Vol. 10, 1912, p. 152, pl. 6, fig. 15) for a single species named *morani*. The figure of the species shows a conical object with centrally located apex, certainly lacking in very distinctive characters as Dr. Pilsbry has recently pointed out (Nautilus, Vol. 38, p. 75, 1925).

On March 3, 1922, Mr. Hannibal told me that he had discovered, subsequent to publication of the description, that this organism was the mold of the cup-shaped depression in the end of a vertebra of a fish. In view of the active studies being made in the family *Lancidæ* it seems desirable to publish this note.

The type specimen has been found in the paleontological collection at Stanford University and is there numbered 2. There are some minute fragments of shelly substance adhering to the cast and these show a delicate but decided radial sculpture. If the object were the inside mold of a *Lanx* it is not probable that such sculpture would show at all.

Also, around the margin there are some irregular ridges of shelly substance. Similar structure has been seen around the

margins of vertebra of fishes but not in the family of mollusks, *Lancidæ*.

The specimen is preserved in a portion of a small concretion, very similar in many respects to concretions found near the mouth of the Columbia River as at Knapton, Washington and Astoria, Oregon.

It seems altogether probable that a mistaken locality label may have led Hannibal to make his original determination and the name *Zalophancylus* should be transferred to the Class Pisces. The locality given with the description was Pliocene lake beds in the Badland Hills one mile east of Sand Hollow, eastern Oregon.

PARTULA IN GUAM[1]

BY T. D. A. COCKERELL

After an extensive study of *Partula* in the Society Islands, where the genus is most abundantly represented, Dr. Crampton thought it well to examine the Mariana Islands, over 4000 miles distant, at the extreme northwestern end of the range of these snails. He found there only four species, one of them new, but the observations made amply justified the expedition. The results are set forth with the minuteness of detail, lucidity of exposition, and abundance of beautiful figures which we have come to expect in Dr. Crampton's reports. The one new species discovered, *P. salifana*, was found only in a single locality on Mount Salifan in Guam. It is very distinct, and in several respects approaches the Society Island type of *Partula* rather than the section hitherto known from Guam. It seems likely that it is not a recently evolved species, developed from the *Partula* population of the surrounding country; but rather an old form, probably once much more widespread, and now limited to a small region, where it is nearly extinct. Merrill (1914) ex-

[1] H. E. Crampton. Studies on the Variation, Distribution and Evolution of the Genus Partula. The species of the Mariana Islands, Guam and Saipan. Carnegie Institution, 1925. Pp. 116, 14 plates.

pressed the opinion that prior to the advent of man, Guam was undoubtedly covered by a continuous forest. Crampton shows that there now exist large open areas, quite unsuited to *Partula*, and there can be no doubt that the snails have been exterminated in many places where they once existed. The question is discussed, whether the Mariana Islands represent the peaks of a much larger, submerged, area, or have developed by uplift from the ocean bed. The geological evidence appears to support the latter view, but Crampton regards the biological facts as favoring subsidence. He points out that as a matter of fact, these snails do not appear to be transported from island to island, even when the islands are not very far apart. His observations do not favor the hypothesis of oversea transport, although he recognizes that *Partula hyalina* is found in Tahiti as well as in the Cook and Austral groups. Merrill, commenting on the poor flora of Guam (225 indigenous species, 27 per cent endemic), remarks that Guam is undoubtedly recent from a geological standpoint, and sees in this supposed fact an explanation of the condition of the flora. There is not a single endemic genus of plants, though one genus is only known from Guam and Yap. I venture to think that Merrill does not make sufficient allowance for the extermination of the flora since man's arrival. It can hardly be doubted that what we now see is but a fragment of what once existed, and my own observation (e. g. in the Madeira Islands) is that the plants of insular areas disappear with human occupation much more quickly than the snails. Introduced woody plants compete with the native ones even in the forests, but the snails survive so long as they have cover, and are less dependent on precise types of environment than the insects. In my study of bees from the islands of the Pacific, I have found that those of Guam closely resemble in type those of Samoa and other parts of Polynesia, but all these differ strongly from the bee fauna of the Hawaiian Islands. Considering the ocean depths to the south and east of Guam, it appears almost inconceivable that there was ever a land connection with the groups of islands south of the equator, which are now occupied by *Partula.* But the whole fauna of the islands from Guam to Tahiti certainly shows a singular

congruity, indicating past migrations over the area. The time involved is probably very great, and it does not seem necessary to postulate continuity of land at any particular period from one end of the Polynesian group to the other.[1]

In dealing with the color-variations, Crampton proposes special names, "not of taxonomic significance." Hence he gives the name *strigata* to a particular form of *P. radiolata*, although it was earlier named *rushii* by Pilsbry. The names of the color types are similar to those employed elsewhere, especially in Europe, for what are called varieties. It does not appear possible to regard them as outside taxonomy, and there is no warrant, under the present rules, for disregarding priority. At the same time, it might be possible and desirable to eventually establish a sort of code of names for such variations, requiring the same designation to be employed for parallel variations of different species. Even so, the names should be formally proposed and type specimens preserved, or uncertainty will result.

REVERSED LYMNAEA PEREGRA[2]

BY T. D. A. COCKERELL

Jules Verne, who knew well how to dramatize natural history, was well aware of the wonder and interest excited by reversed coiling in shells. In his *Twenty Thousand Leagues*

[1] Dr. P. Marshall, in his address before the Australasian Association for the Advancement of Science, published in 1912, concludes that bathymetrical, structural and petrographical characteristics support the idea that the real boundary of the southwest Pacific passes through New Zealand, Kermadec, Tonga, Fiji, New Hebrides, Solomons, and on to the Admiralty Islands. He thinks that the land connection or approximation took place in the late Mesozoic or in the Pleistocene, probably both. The eastern Pacific islands are different in structure, nature and origin, and have derived their fauna and flora by chance migrants from the region just indicated. The headquarters of *Partula* are then in a permanently oceanic group.

[2] The Inheritance of Inverse Symmetry in Limnaea peregra. By Cyril Diver, assisted by A. E. Boycott and Sylvia Garstang. Journal of Genetics. March, 1925. Vol. 15, pp. 115–200.

Under the Sea, he represented the naturalist as picking up a reversed shell on a tropical shore, when just as he was gloating over his find, a stone thrown by a savage smashed it in his hand. In all my years of collecting, I have never met with an abnormally reversed specimen, but my brother S. C. Cockerell was fortunate in finding a pond in Surrey, where sinistral *Lymnaea peregra* were not uncommon. On one occasion, after we had been discussing the phenomenon, he plucked up courage to write to Professor Huxley, who replied kindly, but could give no explanation. In the forty years since that time, biology has been largely transformed, and if we do not yet know the "explanation" of reversed coiling, we at least know a good deal more about the subject and its genetic significance. Captain Cyril Diver, in the elaborate paper cited in the footnote, gives a full account of recent experiments with *L. peregra*, accompanied by a discussion of the theoretical bearing of the results.

Beginning with a general account of dextral and sinistral gastropods, he goes on to record the known cases of sinistral *L. peregra*. It is perfectly clear that the reversed coiling is not due to the external environment, but is controlled by germinal factors. In several cases particular ponds have produced numerous sinistral shells, though dextral ones were always far more numerous. Extensive breeding experiments with sinistral *L. peregra* were started and carried through with the cooperation of several workers, residing in different parts of England and Wales. It was found that fertile eggs were readily obtained from single, isolated individuals. The question arises whether such cases represent parthenogenesis, or self-fertilization. The character of the inheritance shown by the offspring indicates the latter. The cross-breeding of individuals of opposite coiling was not practicable, but sinistrals could be crossed with sinistrals, dextrals with dextrals. In general, isolated snails gave either all dextral or all sinistral offspring, and when a pair gave half and half, it was found that the dextrals were from one parent, the sinistrals from the other. However, isolated individuals would give sinistrals with few odd dextrals, or the reverse. It is indicated, but not yet proved, that certain crosses of heterozygous individuals give a 3 to 1 ratio.

It is shown that the direction of the spiral is determined at the very beginning of development. In fact, it appears to be a property derived from the cytoplasm of the egg cell, the "cytoplasmic prelocalization" described by E. B. Wilson. This does not mean that there is no control by nuclear determiners; such control exists as it does for other characters, only the properties of the egg-cytoplasm are those due to the chromosomal complex of the egg-producer, regardless of the sperm introduced at fertilization. Thus a dextral snail may produce all sinistral offspring, the character of the latter being determined by its chromosomes, while its own character was determined by the chromosomes of its parent. This seems very extraordinary at first sight, but is quite intelligible, and appears to be fully supported by the evidence.

How comes it, then, that some broods are not uniform, and what is the meaning of the occurrence of strange monstrosities such as are figured on plate V? It is set forth that the dextral condition is not to be regarded as dominant to sinistral, in the usual Mendelian fashion. They are rather to be thought of as approximately equal but opposing forces, in heterozygous individuals. Were they exactly equal, a bilaterally symmetrical animal should result, but this does not happen. One or the other type predominates, but exceptions occur, and the monstrosities may be related to the internal struggle. However, the author develops a supplementary hypothesis of "suppressed" inheritance, and after assembling the evidence concludes that broods mostly sinistral with a few dextrals are "suppressed" dextrals, and those mostly dextral with a few sinistrals are "suppressed" sinistrals. He further supposes that the inherited germinal constitution may acquire a power of resistance to the nuclear factors, as a result of "selective breeding, isolation and time"; in other words that the cytoplasmic properties of the egg-cell may not be due simply to the parental germ-plasm, but to the accumulated effects of past generations. In all this, we pass into a region of speculation, where many will hesitate to follow. It would perhaps be possible to add another hypothesis, namely that whereas the character of the sperm did not ordinarily affect the coiling of the zygote pro-

duced at fertilization, the "prelocalization" might at times be insufficient or its effects delayed, so as to allow the sperm to play its part. At all events, the experiments are proceeding, and it is quite certain that Captain Diver and his associates have opened up a quarry rich in possibilities for discovery; one which has already given us at least one important contribution to the theory of heredity. The principle of deferred inheritance, or dominance by the parental cytoplasm, is fully recognized and elucidated by Wilson (The Cell, Third Edition, 1925), who further remarks, "it is evident that every character is produced during development by an activity in which the cytoplasm, and what we call the 'organism as a whole' plays a most important part." Wilson, following Sturtevant, gives a very clear statement of the *Lymnaea* case (t. c., p. 1109), remarking that "these curious relations, at first sight so mysterious, at once become perfectly plain when we perceive that the effect of the sperm-chromosomes is delayed for one generation."[1] Nevertheless, there are other complexities which at present do not "become perfectly plain," and it is through the intensive study of these that further important theoretical advances may be expected.

It is difficult to understand why Gwyn Jeffreys is throughout called "Jeffries," and on p. 198 Conklin is called Conklyn."

A NEW TEXAN BULIMULUS

BY JAS. H. FERRISS

In 1924, passing through Sanderson, a place on the Southern Pacific route west of the Pecos River, I found numerous specimens of a Bulimulus which was at once recognized as new to me. By a curious accident, the shells went astray, only a broken one, noticed in NAUTILUS, vol. 38, p. 41, was to be found when I got home. This year more were taken.

[1] In a similar manner, the color of silkworm eggs appears to be controlled by maternal influences regardless of the sperm. (Rettew, 1925.)

BULIMUS PILSBRYI, new species.

The shell has a narrow, compressed umbilicus, and is slender, the diameter less than half of the length; the outlines of the spire are somewhat convex, the whorls moderately so. The surface is nearly smooth, rather glossy; most of the first whorl irregularly rugose, the second having straight, regular axial riblets; subsequent whorls with weak growth-striæ. The color is light pinkish-cinnamon profusely streaked with opaque white, the streaks somewhat ragged (or in some specimens smooth and blending into the ground-color). The aperture is small, oblique, the outer lip thin, narrowly expanded, the columellar lip broadly expanded; the ends of the lip approach more than usual and are joined by a thin, transparent film.

Length 27.8, diam. 12, length of aperture 12.5 mm.; 6⅓ whorls (type, A. N. S. P. coll.).

Length 27.5, diam. 12.3 mm. (paratype, Ferriss coll.).

Length 28, diam. 12.7 mm.

By its slender figure and narrow aperture this species recalls some of the Mexican and Lower Californian forms, such as *B. inscendens* (W. G. B.). It is strikingly unlike other Texan species. It seems very strange that a species so distinct has occurred at Sanderson only, other Texan Bulimuli being rather widely distributed.

The shell and anatomy will be illustrated in a paper on the shells of western Texas now in preparation by Dr. Pilsbry and myself.

A NEW ACTEOCINA FROM BRITISH COLUMBIA

BY WILLIAM H. DALL

ACTEOCINA OLDROYDI, new species.

Shell small, solid, subcylindric, white, with three and a half whorls; suture narrow, channelled; spire short and rather blunt; the specimen has the entire surface decorticated, so

that the surface characters cannot be definitely described, but the indications are that the incremental lines are rather rude and irregular; the base is rounded, with a deep chink, almost an umbilicus, behind the anterior portion of the inner lip; the shell is very slightly constricted medially; the aperture is narrow behind, the posterior commissure rounded, falling short of reaching the suture; the anterior part of the aperture is wide, rounded evenly into the pillar lip which shows no plait; the entire lip is thin and sharp, with a thin layer of enamel on the body. Length of shell, 8.5; of aperture, 6.5; maximum diameter, 4.5 mm.

Dredged in Departure Bay, British Columbia; T. S. Oldroyd. U. S. Nat. Mus. Cat. No. 333664.

While the surface characters of this species are obscure, its size and proportions definitely separate it from the species hitherto known from the region.

SHELL NOTES FROM ITALY

BY H. N. LOWE

Today is Good Friday, and Naples had the best display of fish of the year. I took a long walk through the old part of the city. The street stalls were piled high with all manner of fish and mollusks; great piles of squid and octopi of several species, buckets of clams, several kinds, and bushel baskets filled with snails which were continually crawling out into the street. There were long strings of black Mytilus. These mussels are raised attached to ropes of palm fiber, and appear to be sold by the yard. Yesterday morning, while waiting at the Santa Lucia dock for the Capri steamer, I saw fishermen bringing in boat loads of Mytilus, all in these long strings, about eight inches in diameter, growing on fiber ropes.

On the same dock were long ropes to which earthen jars were attached at intervals of about two yards, which I found were intended as homes for unsuspecting octopi.

The Zoological Station has a wonderful display of marine life, though the fish are not as gorgeous as those at Honolulu.

Clausilia seems to be almost everywhere here, from the rocks of Capri to the Pompeian theatre.

On the hills back of Palermo I found about a dozen species of Helices and Clausiliæ. At Girgenti they had even climbed to the top of the temple of Concordia. I enjoyed an interesting day collecting them around the Greek temples and rock tombs.

At Isola Bella, below Taormina, small marine shells were plentiful. About thirty-five species rewarded my exertions.

While in Palermo Mr. Beltrani kindly showed me his collection of mollusks and slides of radulae. He took me to see the famous collection of the Marquis of Monterosato, probably the richest in the world in Mediterranean mollusks, and containing a large number of types. It was a great privilege and treat to see this magnificent collection.

Taormina, April 10.

NOTES AND NEWS

The Emendation of Scientific Names. — There is a tendency among some scientific writers to change the original form of a word to suit their own ideas as to its proper construction. This leads to no end of confusion and only adds to the synonymy. The rules of nomenclature clearly state that a name cannot be changed unless there is an obvious typographical error. Mr. J. R. le B. Tomlin, in the *Journal of Conchology,* vol. 17, p. 136, says: "There is at present among some Continental authors a deplorable tendency to tamper with the terminations of both geographical and personal specific names, apparently in a pedantic attempt to bring them into conformity with classical usage. In a recent and otherwise admirable work entitled 'Faune Malacologique . . . des Iles Mascareignes', Dr. Germain has thus arbitrarily altered no less than 25 such names, the net and only result being the creation of 25 unnecessary synonyms. No protest

can be too vigorous against this unjustifiable practice."—C. W. J.

Dr. John Mason Clarke, New York State geologist and paleontologist, Director of the New York State Museum and of the science division of the Department of Education, emeritus professor of geology at the Rensselaer Polytechnic Institute, died at Albany on May 30, at the age of sixty-eight years.

Snails Eaten by Shrews. — The following shells were turned over to me for identification by C. M. Davis. These he collected in the runways of the short-tailed shrew (*Blarina brevicauda talpoides*). All of these specimens had at least the first two whorls missing. Apparently this shrew is one of the worst enemies of land mollusks in this particular section (Ann Arbor, Michigan) as quantities of gnawed shells are to be met with on all sides while collecting in the wooded sections. The shells have been identified as follows: *Pyramidula alternata* Say, *Omphalina cuprea* Raf., *Polygyra albolabris* Say, *P. zaleta* Binn., and *P. thyroides* Say.—W. J. Clench.

The collection of Helicoid land shells of the late G. K. Gude of London, England, is for sale. It is a large and valuable collection containing about 4500 accurately determined species and varieties. Also well-bound copies of the monographs of Helix and Bulimus from the *Conchologia Iconica*. For further particulars apply to Bryant Walker, 1306 Dime Bank Building, Detroit, Mich.

R.[adiodiscus] orizabensis Pils., mentioned in Nautilus XXV, p. 49, was never described. It turns out to be identical with *Striatura milium meridionalis* (Pils. & Ferr.), described from Arizona, and now first recorded from Mexico (near Orizaba).

The genus *Orthaulax* Gabb, hitherto known only from the

American Oligocene and Miocene (Florida, West Indies), has been turned up in southern Japan, the species *Orthaulax japonicus* being described by Takumi Nagao (Japanese Journal of Geol. and Geogr. III, No. 1, 1924) from the provinces Hizen and Higo, in beds considered Eocene—thus earlier than the appearance of the genus in America.

Nahant Beach Shells.—In the Nautilus, Vol. 34, No. 4, 1921, p. 100, Mrs. L. D. Thompson published a short list of the mollusks occurring at Nahant Beach, Massachusetts. The following additions might be of interest for local records: *Alectrion obsoleta* Say, *Crepidula plana* Say (in dead *Polinices heros*), *Aporrhais occidentalis* (Beck.), *Mya arenaria* Linn., *Petricola pholadiformis* Lam., *Callocardia morrhuana* (Lins.), *Thracia conradi* Couth.—William J. Clench.

Robert Standen, M.Sc.—"The old friends of Robert Standen in the B.N.F.C. will be sorry to hear of his passing. He was an all-round naturalist, and frequently joined in field excursions in Northern Ireland, while in the same district he made many surveys of limited areas — Ballycastle, Rathlin Island, Whitepark Bay, Murlough, and Glenshesk—his subsequent notes on these being of the utmost interest and value. He was an Ex-president of the Conchological Society of Great Britain and Ireland and either author or joint author of the names of hundreds of species of shells new to science. Indeed, Mr. Standen was one of the best known conchologists in the world, and his knowledge of marine zoology and botany generally was only second to that of the Mollusca. He also took a keen interest in the ethnology of native races, and it was he who arranged the fine ethnographic collections in the Manchester Museum. His arrangement of cases and cabinets of Mollusca in the same institution have long been noted as the best of their sort in the British Isles or elsewhere. Mr. Standen was 71 years of age, and passed away last week in Manchester. He had only lately received the Hon. Degree of M.Sc. from Manchester University, and honored by his old friends and colleagues with a token of their esteem.—R. J. W."

The Attachment of Oyster Larvæ.—The 1923 report of the New Jersey Department of Biology, issued in 1925, contains the following observations by Dr. Thurlow C. Nelson:

"It is a pleasure to report that at last, after years of search by the late biologist and by his successor, the attachment of oyster larvæ has actually been observed under semi-natural conditions. Finding large numbers of oyster larvæ of mature size about the houseboat on the evening of July 22, we lowered a glass plate, 3x4 inches, vertically from the deck at 8 p. m., and raised it half an hour later.

"The plate was suspended horizontally in a dish of creek water and observed under the binocular. Six oyster larvæ were found moving about on the surface of the glass, holding on by the foot. By extending the foot and then contracting it sharply the larvæ described circles of ever-decreasing diameter, the first larvæ coming to rest finally at 8:46 p. m. Holding fast to the glass by its very adhesive foot, the larva placed itself in position, left valve downward, and inclined to the surface of the glass at an angle of about thirty degrees. The margin of the mantle was extended in contact with the glass for two minutes and then was withdrawn. The foot, its cilia beating feebly, was slowly drawn up between the valves, and eleven minutes after the larva stopped moving over the glass, fixation was accomplished.

"Most investigators, including the writer, believed that fixation was effected through the secreting border of the mantle cementing the larva fast. Stafford, however, found that the space between the left valve of the spat and the substratum was nearly filled with the cementing substance, and he concluded that the byssus gland must pour out the substance in liquid form, which subsequently hardened and held the spat fast. That such is the case we are now able to confirm from direct observation."

The Monograph of New York Mollusks, long in preparation by Dr. Pilsbry, has now been completed, and it is expected will be published as soon as practicable by the State Museum,

Department of Education, Albany. As most of the species of Canada, New England and the Middle States occur in New York, and many forms of wider range are discussed incidentally, the work should have some interest beyond the boundaries of the State. As the size of the edition will probably depend somewhat on the demand, those desiring copies should so notify the Secretary of the Museum.

New Forms of Polygyra (Triodopsis) loricata.—*Polygyra loricata querceti.* The shell is smaller than typical *loricata*, with the three teeth relatively much larger, the parietal tooth long and strong. Cuticular processes are moderately well developed. The whorls are closely coiled. Height 3.8, diam. 6 mm., 5½ whorls (type); height 3.4, diam. 5.2 mm., 4¾ whorls. Oakland, California. Type and paratypes No. 11147 ANSP. This form has been called Var. *minor* Hemphill, but that name had been used previously in the genus.

Polygyra loricata lowei. The surface is smooth, lacking cuticular scales or threads, somewhat glossy. Teeth are very small, the parietal tooth inconspicuous. Height 3.5, diam. 6.4 mm., 4⅓ whorls. Taken 24 miles east of Placerville, California, near a roadside spring, by Herbert N. Lowe, 1916. In older specimens the teeth may perhaps become larger, but the smooth surface is characteristic.—H. A. Pilsbry.

PUBLICATIONS RECEIVED

On some South African Gulellæ, with descriptions of new species and varieties. By Henry Clifden Burnup (Annals Natal Mus. V, part 2, 1925). *Gulella* is one of the largest genera of South African land snails, intricate and difficult by reason of the numerous closely related species. Besides the critical notes, descriptions and figures given in this paper, Burnup has found that in some species the young have variously arranged apertural teeth, a character not observed hitherto in this genus, though known in the related *Ptychotrema*.—H. A. P.

Fauna and Stratigraphic Relations of the Tejon Eocene at the Type Locality in Kern Co., California. By Frank M. Anderson and G. Dallas Hanna (Occas. Papers Cal. Acad. Sci., March, 1925). A useful study of this fauna, about which there has been so much controversy and uncertainty.

Notes on Some Arctic Mollusca from Greenland. By Dr. L. Soos and Hans Schlesch (Ann. Mus. Nat. Hung., XXI, pp. 94-104, 1924). The authors state that present land and freshwater molluscan fauna of Greenland consists of ten species. The anatomy of *Phenacolimax angelica* Möll., *Succinea groenlandica* Möll. and *Limnæa vahlii* Möll. are described and figured.—C. W. J.

Notes on Some Mactridæ. By J. R. le B. Tomlin (Jour. Conch., vol. 17, pp. 134-136, 1924). The exact dates of publications of Reeves' and Deshayes' species are given.

Notes on South American Ancylidæ, I. By Bryant Walker (Occasional Papers, No. 157, Mus. Zool., Univ. Mich., pp. 1-7, pl. 1, Apr. 4, 1925). Four species are described and figured, one, *Gundlachia lutzi* is new.

Studies in Ampullaria. By E. G. Alderson, M.A.[1] The author states that his intention originally was to accomplish a complete monograph of the Ampullarias, the existing monographs being more than sixty years old; but this plan was relinquished, and only shells in his own possession are described and figured. "The more one studies this genus," he writes, "the more evident does it become that casual acquaintances therein are of no profit. . . . To understand the Ampullariæ one must handle them almost daily, and have the whole of one's material ready for comparison and discrimination." Among the American species treated, several have been

[1] Small quarto, xx + 102 pp., 19 plates. W. Heffer & Sons, Ltd., Cambridge, England.

"storm centers" in the literature of the group; Mr. Anderson's views will be interesting to those who have worked over them. The section on Asiatic forms contains some useful rectifications, such as the deletion of *A. dolioides* Reeve, and a full discussion of *A. ampullacea* L., type of the genus. Thirteen African species are figured. The generic name *Ampullaria* is used for both American and Old World species, though the use of Pila for the latter is mentioned. The 164 natural-size figures by the author are characteristic Ampullaria portraits, evidently drawn with great fidelity and well reproduced. It is to be hoped that Mr. Alderson's collection will continue to grow and that he will be encouraged to continue his Studies in Ampullaria.—H. A. P.

On the Radula of Coxia. By Lieut.-Col. A. J. Peile (Proc. Malac. Soc. London XVI, p. 194, April, 1925). The radula obtained from a dried animal shows that this peculiar genus belongs in the neighborhood of *Trochomorpha,* not to the Rhytididæ or Streptaxidæ as hitherto supposed.

Microscopic Sculpture of Pearly Fresh Water Mussel Shells. By Wm. B. Marshall (Proc. U. S. Nat. Mus., vol. 67, 1925, pp. 1-14). Under the compound microscope most Mutelidæ examined show minute and remarkably regular radial striæ. They are present in *Spatha, Mutela, Monocondylæa, Anodontites, Diplodontites,* etc., but not in *Chelidonopsis* or *Diplodon.* This structure is apparently of value in determining relationships of genera.

Quaternary and Recent Molluscan Faunas of the West Coast of Lower California. By Eric Knight Jordan (Bull. Southern Cal. Acad. Sci. XXIII, 1924, pp. 145-156). Notes on three marine deposits of Quaternary age, Magdalena Bay, San Ignacio Lagoon and Scammon's Lagoon, with lists of the mollusks and their range in the Recent fauna. The indications of these faunas bearing on Quaternary climates are considered.—H. A. P.

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The Mollusca Collected by the University of Michigan —Williamson Expedition in Venezuela. By H. Burrington Baker (Occas. Papers, No. 156, Mus. Zool., Univ. Mich., pp. 1-44, pls. 6-11, Apr. 4, 1925). This paper is part III, covering the Pupillidæ to Oleacinidæ. A new section *Pseudoguppya* is proposed, with *Helix cassiquiensis* Pfr. as the type. In the Streptaxidæ the following new genera and subgenera are proposed: *Rectartemon, Tamayoa, Miradiscops, Punctodiscops, Systrophiella,* and *Happiella.* Nine new species and subspecies are described.—C. W. J.

Miocene Mollusks from Bowden, Jamaica: Pelecypods and Scaphopods. By Wendell P. Woodring. Published by the Carnegie Institution of Washington. 222 pp., 28 plates. The beautifully preserved fossils of the Bowden formation have been noticed occasionally in palaeontological literature for over fifty years. Numerous authors have referred to or described particular species, but in some cases the descriptions and illustrations left much to be desired, and were a source of perplexity to those working on allied faunas. The Bowden fauna is a very rich one, and a full report was much needed by all concerned with tropical American Tertiary faunas. The memoir now completed for the bivalves and tooth-shells is done in the thorough manner of all of Woodring's work, and will be found highly interesting. The treatment of such difficult groups as the arks and pectens is commendably clear. A few unexpected forms turned up, such as a new species of the rare genus *Neæromya*, and a species of the Pacific family Juliidæ, appropriately named *Julia gardneræ* for an industrious worker on the Miocene.

Woodring concludes that "the Bowden formation is of middle Miocene (Helvetian) age. It is approximately the equivalent of the Gurabo formation of the Dominican Republic and the Gatun formation of Panama and Costa Rica."—H. A. P.

The Effects of Ultraviolet Light on Pond Snails (Linnaeus). By C. W. M. Poynter and Alan Moritz. 'Journal of

Experimental Zoology, Vol. 37, No. 1, January, 1923.) This paper deals primarily with the effect of ultra-violet light rays on the pond snails, *Lymnaea*. Experiments with both ultra-violet light rays and heat were made to determine time and type of coagulation of the protoplasm.

Attention is called to the authors' apparent lack of interest in specifying what particular species was used. In the conclusion set forth by the authors, "Snail embryos present a wide range of individual resistance to the action of ultra-violet rays. Resistance increases with advance in age." It would be interesting to know whether or not more than one species was used in the experiment. From the viewpoint of the experimental zoologist the work may be satisfactory, but many students in other branches of biology depend upon such experimental work to explain and solve problems in their own fields, the latter find that the lack of exact determination of the species involved often makes the contribution practically valueless to them. Indefinite data, when definite data can be obtained, does not add materially to the subject. The spelling in the title of the generic name, if copied directly by bibliographers, will cause considerable confusion, even though the mistake is partly rectified in an abstract printed in Spanish accompanying the authors' separate, in which the snail appears as *Lymnaeus*.—W. J. Clench.

A Monograph of the Australian Loricates. By Tom Iredale and A. F. Basset-Hull. (The Australian Zoologist, Vol. III, parts 5–8, 1923–5.) While many of the chitons of Australia were described about a century ago, the descriptions were so inadequate that they remained practically unknown. It is only in the last 25 or thirty years that critical and exact methods have been applied in either collecting or studying them. By the work of Bednall, Hedley, Edwin Ashby, Basset-Hull, Iredale and others, a great number of new species have been turned up, type-localities of the old authors have been collected over; with the new material, and re-examination of old types, many of the species of Blainville have been recognized, and those of Reeve redefined or discarded.

In the monograph now in progress, the whole subject is brought up to date by two of the naturalists who have been most active in the work. Only a few features of their treatment need be noticed here, as all interested in chitons should possess the monograph. As usually happens, the old genera are further divided. Thus, in what was formerly included in *Ischnochiton*, the following genera are recognized: *Ischnochiton*, *Autochiton* (n. g.), *Heterozona*, *Strigichiton*, *Haploplax*, *Stenochiton*, *Anisoradsia*, *Ischnoradsia*, *Subterenochiton* (n. g.). The old name *longicymba* Blv. replaces *Stenochiton juloides*.

The Lepidopleuridæ are viewed as degenerates from an Ischnochitonoid source. All of the Austral genera are considered different from the northern. *Lorica*, *Loricella* and *Kopionella* are segregated in a family Loricidæ.

In general, the girdle armature is given more weight in classification than formerly.

All of the species are illustrated. The beautifully drawn figures are a very attractive and valuable feature, since no chiton can be considered fully defined until it is really well figured. Photographs, unless of a high degree of excellence, do not come up to the requirements.

Having had the privilege of collecting chitons with both authors, and of going over part of the collection of the senior author, the writer feels a good deal of confidence in the work under consideration, and has a great respect for the prowess of the authors as chiton collectors.

If any fault is to be found with this monograph, it is in the changing of the name Polyplacophora to "Loricata." The rule of priority, if strictly enforced, would leave few Class or Order names. Thus Pelecypoda would become *Bivalvia* L., Gastropoda would be *Univalvia* L. But names of Orders have never been considered as subject to priority rules as genera and species are, and there appears to be no advantage in the change proposed. As to the use of "loricate" as a common name to replace "chiton," that too seems of doubtful advantage. Everybody concerned calls these animals chitons, without any confusion with the restricted genus *Chiton* that I ever heard of. Why try to juggle with the name as if it were a Russian capital city?—H. A. P.

The Nautilus.

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THE EXHIBITION OF MOLLUSCA IN A MUSEUM

BY CHARLES W. JOHNSON

A museum should make its molluscan exhibit as attractive and educational as possible. A purely systematic collection with few shells and long printed labels, with the nomenclature changing daily, will do little to create an interest in the Mollusca. Shells are only equivalent to the skeletons of vertebrates, and convey little or no idea to the public of how they grow or of the animals that constructed them. They would probably appeal to many visitors as a great hall of skeletons in a museum in Paris, did to a friend, who sent me a picture of the hall on which he had written "Some valley of dry bones."

How can we show in a clear and attractive way the creatures that build the shells? The best preserved specimens in alcohol or formaline usually look more dead than their shells. Undoubtedly the most attractive way to show Mollusca, both those with and without shells, is by glass models such as the Blaschkas used to make before they devoted all their time to making glass flowers for the Harvard museum. Glass models are not now obtainable and few museums can afford skilled artisans such as the American Museum of Natural History employs to make their beautiful and instructive groups of marine invertebrates. The Boston Society of Natural History is quite fortunate in having over 200 Blaschka glass models of mollusca,

but most of these represent foreign species and are available only for the synoptic collection.

Next to the glass models the best way to show the Mollusca of a local or given area, and a way available to all museums, is by the use of colored drawings from life, made by a skilful and careful artist. People are accustomed to looking at pictures and are not so apt to be misled by an enlarged drawing as by an enlarged model. Also with enlarged drawings the details of very small species can be worked out with greater accuracy than in the models. To add to the attractiveness of the New England collection and make it more instructive, the Boston Society of Natural History is placing with its exhibition of shells, beautiful colored drawings of the animals, made by the well-known scientific artist Mr. J. Henry Blake. More than 100 drawings are now in the collection, also some 30 Blaschka models and numerous maps to show the distribution of the more interesting species.

Among other interesting objects at the seashore are the egg-capsules of the various gasteropods which should always accompany the species. The egg-capsules of *Buccinum undatum* and *Chrysodomus decemcostatus* were figured in THE NAUTILUS, Vol. 31, pl. 1. Mr. Owen Bryant some years ago gave the Society a tube containing 1700 embryonic shells taken from one string of capsules of *Busycon carica*, but the number of capsules was not mentioned. One cannot always find a string of capsules in which the embryonic shells are well developed and the small holes through which they escape are all closed. A part of a string, containing 18 capsules intact, was found in the collection, these containing from 11 to 27 shells each, an average of about 20. Complete strings contain between 80 and 90 capsules, not counting the smaller ones that serve as an anchor for the string.

The sand-collars are conspicuous objects of a sandy beach, but it is surprising how few really know that these are the nidus or nest of the sea snail. The nidus of the Northern Sand-collar Snail (*Polinices heros*) has a plain edge, while the Southern Sand-collar Snail (*P. duplicata*) has the edge wavy. The little collar of *P. triseriata* is not often found as the snail frequents

deeper waters. Although sand-collars are common in the shoal waters in June, they are comparatively scarce in August, when they contain the embryonic shells. Mr. A. B. Fuller obtained one of *P. heros* on the Georges Bank in 45 fathoms, with the young shells ready to leave the collar.

To show variation and some of the conditions that govern the various forms, sculpture and color of shells, is another interesting feature. The species of Slipper shells (*Crepidula*) are admirable for showing variation and mutation due to their habit of growing on objects of various form and color. *C. glauca* becomes the variety *convexa* when living on a very convex surface. When found on *Alectrion* (*Ilyanassa*) *obsoleta* they are a uniform dark brown, but on *A.* (*Tritia*) *trivittata* they are light colored with brown spots. *C. fornicata* is usually darker when growing on a horse-shoe crab than when growing on a large Busycon. When attached to scallops (*Pecten irradians*) they adopt its ribbed sculpture. The forms assumed by *C. plana* are marvelous. *Crucibulum striatum* growing on the almost smooth *Pecten grandis* have the sculpture obsolete or wanting. The jingle shells (*Anomia simplex*) also shows wonderful adaptation to its surroundings; very convex and often with a free edge when attached to pebbles, they are ribbed on *Pecten irradians* and sometimes so crowded on an oyster shell that they become angular. The little *A. aculeata* often lacks its scaly sculpture when growing on a smooth surface.

The rock or dog whelk (*Thais lapillus*) shows a wide range in size and color. Form is usually considered to be the result of environment, but color is largely hereditary. Shells from an exposed situation are smaller than those from more sheltered places, while the variety *imbricata* usually frequents muddy situations. On rocks covered with white barnacles (*Balanus balanoides*) or where the rocks are light-colored, the shells of the whelks are white, while on mussel and algae covered rocks the shells vary in color from blackish brown to light brown, orange and yellow, with but a small percentage white. An interesting paper on "Variation in the Dog Whelk," by Harold Sellers Colton, appeared in "Ecology," Vol. 3, pp. 146–157, Apr., 1922. *Littorina rudis* is another shell that shows remark-

able variation. Although many forms are recorded in Europe, only *tenebrosa* has been recognized here. Environment seems to be the governing factor, *tenebrosa* usually frequenting the marshes and the other forms the rocks, often far above the high water mark. They vary in color to a great extent according to the color of the rocks they frequent. At Bass Rocks, Gloucester, Mass., in algae at about half tide is a colony scarlet in color.

Where conditions are as diversified as in New England maps showing the distribution of certain species will be found very useful and instructive.

ISOLATION AND CURACAO

BY H. BURRINGTON BAKER

Those of us who were initiated into the mysteries and delights of conchology through our interest in a local fauna of eastern or central United States, or of any continental land mass where the barriers are few and far between, find it difficult, at first, to realize the necessity for exact localities. Although we may find a certain species in a woodlot but absent from the adjacent cedar swamp, we soon recognize that this restriction is purely edaphic and ecological. Under similar conditions, the same forms usually turn up over and over again, even if we travel miles away from the region of our first acquaintance with our sluggish and secretive favorites. Once in a long time, we may come across such exceedingly exclusive eremites as *Hendersonia occulta* (Helicinidae), which, for example, occurs abundantly in the deep limestone gorge at the base of the Virginian Natural Bridge, but is quite absent from the rich forests of the surrounding hills, just as it is from most parts of its remarkably discontinuous range. However, such cases are exceptional, and usually the notation of exact localities does seem almost a waste of time and space.

As a result, we are apt to be totally unprepared for the amazing segregation that occurs in regions where the barriers are numerous and relatively impassable. Even if we have followed

the intensive explorations of Pilsbry and Ferriss in southwestern United States, or have read accounts of such a conchologist's paradise as the Hawaiian Islands, we scarcely are in a position to visualize the almost complete change of fauna that may occur in a few miles, or even in a few yards. At least, I must confess that the actuality of isolation came almost as a distinct shock, when I sauntered out of Willemstad, Curaçao, in 1920, and found a molluscan fauna that was almost totally distinct from that which I had been studying in Venezuela, only forty-odd miles away. And, even then, I was unable to prognosticate what I observed in 1922, the extremely limited distribution of some of the forms from these Dutch West Indies.

As has been described in a previous paper (1924, Occ. P. Mus. Zool. Univ. Mich., no. 152), each of these islands consists of a core of older igneous and metamorphosed strata surrounded by an irregular zone of coral rock. Many of the shells, especially those of the genus *Tudora*, are more or less limited to the limestone rim; as this is broken in many places, especially on Curaçao, by narrow arms of the sea, we get a series of colonies with relatively impassable barriers between them. In addition, the semidesert climate of the islands is only relieved by comparatively brief periods of rainfall, so that the snails are forced to spend most of their lives in a quiescent state. Both of these factors tend to discourage migration, and, coincident with this, we find rapid changes in the facies of the shells within surprizingly short distances; in fact, colonies of *Tudora* which are separated by two or three of the more decided breaks in the shore line show scarcely an intergradient individual. Even more striking is the case of *Tudora pilsbryi*, which is practically limited to the talus below the escarpments of a single monadnock, where it completely replaces the more widespread *T. megacheilos*.

Such a region can only be studied by a conchologist in the field, and even he will have difficulty, as I did, until be realizes the absolute necessity for the careful segregation of the lots from each limited locality. Anyone not especially interested in snails will fail to recognize the need of such intensive analysis,

and a random collection will show only a part of the actual isolation of divergent colonies. Besides, as already indicated, even a conchologist who is not familiar with this type of distribution is slow to comprehend the verity of its occurrence.

In his useful paper "On a Collection of Non-Marine Mollusca from Curaçao" (1925, Bijd. Dierk. Kon. Zoöl. Gen. Amsterdam, Afl. XXIV, 25–32), Tera van Benthem Jutting labors under the load of both these impediments. The limited collection that he describes was picked up in central Curaçao by scientists who were not especially concerned about the mollusks alone. Besides, I venture to suspect van Benthem Jutting himself is more familiar with the widespread fauna of western Europe than with the localized ones of the arid tropics. As a result, his paper contains certain records which I am quite sure are based on misconceptions, and a brief discussion of some of these citations may not be out of order.

Cerion uva (L.). Although a random lot would indicate that *C. u. diablensis* and *C. u. hatoensis* "only denote the extreme limits of variation", it is also true that the mean diameter of specimens from the type locality of the former falls outside the total range of variation in individuals from the typical colony of the latter (see table XII of my paper).

Brachypodella raveni (Crosse). "Tafelberg" is often used by the inhabitants of Curaçao to denote vaguely the southeastern end of the island; as will be shown later, I feel sure that van Benthem Jutting has no shells from the bases of the escarpments of the Tafelberg of Santa Barbara itself. On this account, it is no wonder that he is unable to recognize my subspecies *sanctaebarbarae;* all of his specimens came from localities where only typical *raveni* would be expected.

Microceramus bonairensis curacoanus H. B. B. The subspecific name is not "*curaçaoana.*"

Opeas gracile (Hutton). Doubtlessly an introduced species on cultivated ground.

Pupoides marginatus nitidulus (Pfr.). Cited as "*Pupa (Pupoides) manginata* (Say)". Of course, *Pupa* cannot be used for any Pupillid; if Roeding's "Museum Boltenianum" is rejected, as it certainly should be, *Pupa* will replace *Cerion.*

Succinea barbadensis Gldg. and *S. gyrata* Gibbons. Although I recognized two forms in my poor material, collected during the dry season, I am still skeptical as to their specific separation. Van Benthem Jutting's excellent figures will be of great assistance to that very courageous individual who may attempt, some time in the future, the anatomical studies that will be necessary before we can make any definite statements about the West Indian members of this genus.

Physa cubensis Pfr. An interesting addition to the fauna. However, I would not be inclined to use any freshwater pulmonate that can withstand the dessication of semidesert conditions as an indicator of zoögeographical affinities; *Planorbis pallidus*, at least, certainly enjoys extraordinary means of dispersal, as I found it in a raised cement tank which received its water from a closed well, through the agency of a windmill. Perhaps both of these shells should be classed as "occasional migrants", along with the birds that probably transport them.

Tudora rupis H. B. B. Either a mistaken identification or an error in locality; this species does not occur anywhere in the vicinity of Hato.

Tudora megacheilos (P. & M.). From the localities, most of the specimens would belong to the typical subspecies, although I would expect *kabrietensis* from the vicinity of the Tafelberg. If any of van Benthem Jutting's shells had come from the escarpments of the Tafelberg of Santa Barbara itself, they would have certainly included *T. pilsbryi*, a very distinct and conspicuous species.

Tudora fossor H. B. B. Van Benthem Jutting cites 21 specimens of *Tudora* s. S. from Hato; 10 of these are included under *T. megacheilos*, 11 under *T. fossor*. The latter occurs nowhere in the vicinity of this locality, where the shells are intermediate between typical *megacheilos* and the subspecies *rondeklipensis*, which does somewhat approach the distinct species from northern Curaçao.

Cistulops raveni (Crosse)! The citation of this species from "Tafelberg" furnishes additional proof that the lots so labeled did not come from the escarpments of the Tafelberg of Santa Barbara. Attention is called to the presence of another "Tafel-

berg", that of Sint Hyronimus, in the northern region of Curaçao; in fact, most of the coral-capped monadnocks of the southwestern coast are small "table-mountains".

In conclusion, I may be excused if I diverge considerably from the field of conchology to mention another interesting effect of past isolation on Curaçao. The prevailing language of this island, Bonaire and Aruba is Papiamento, which is only spoken by the natives of this group. The name itself may be roughly translated as "Much talk" or "Art of talking"; it is also called "Spaansch", because many of its users truly believe that it is the original Spanish. Actually, it probably started as a simplified slave-dialect of Portuguese, but it has acquired words from all of the tongues spoken in the West Indies and is characterized by a lack of conjugations, tenses and abstract terms, which makes it strikingly different from the Romance languages. Another peculiarity, which it possesses in common with some primitive languages, is the introduction of each verb by a syllable, pronounced "ta", which simply indicates that the next word will be this part of speech. However, the prospective collectors in Curaçao need not be deterred by any question of a common language, as English is widely spoken and understood in the islands; in fact, the natives, starting with the limited Papiamento, seem to have a propensity to acquire smatterings of several languages, without the ability to express a complicated idea in any of them.

THE TYPE OF ANCYLASTRUM BOURGUIGNAT

BY H. BURRINGTON BAKER

Kennard and Woodward (1925, Naut. XXXVII, p. 83) have recently re-opened the question of the type of *Ancylastrum* Bgt. (Feb. 15, 1853, J. de C. IV, 60, 63) and the validity of *Pseudancylus* Walker (1921, Naut. XXXV. 58). They come to the conclusion that the type of the former is *Ancylus fluviatilis* Müller, while Walker (1921, 5–9) had decided that it was *Ancylus cumingianus* Bgt. (either May 1, 1853, J. de C. IV, 170; or July 25, 1854, P. Z. S., 91).

The differences between the viewpoint of Kennard and Woodward and that of Walker seem to be divisible into three rather separate questions:

1. What species are included in the original *Ancylastrum* (l. c.)?

2. Was *Ancylastrum* proposed as a substitute for *Ancylus* Gray?

3. What subsequent choice of type is valid?

The divergences of the two arguments may be tabulated for each as follows:

Kennard and Woodward	Walker
1. It cannot include species described in subsequent papers.	1. As no species names were mentioned in the original publication, it includes all species that satisfy its definition, regardless of their date of description.
2. Yes.	2. No.
3. Subsequent choice inoperative and could not be *A. cumingianus* in any case.	3. The first choice was by Bgt. in a subsequent paper (l. c.), where the type, *A. cumingianus* Bgt. was also described.

As regards the first bone of contention, I must personally agree with Kennard and Woodward that any genus *should* include only those species known at the date of its description. However, as pointed out by Walker (1921, 7), the International Commission on Zoölogical Nomenclature has definitely ruled otherwise in its Opinion 46, where, in a similar case, it has decided that *Aclastus rufipes* Ashmead (1902) is the type of *Aclastus* Foerster (1868). For this reason, Walker's decision is certainly the correct one; *Ancylastrum* Bgt. (Feb. 15, 1853) does include *Ancylus cumingianus* Bgt. (either May 1, 1853; or July 25, 1854).

The second question is more difficult, but must, I believe, be answered in the negative. In the first place, there is not and never was any such "generic name" as *Ancylus* Gray; *Ancylus*

Müller (1774), type *Patella lacustris* Linné (chosen by Children, 1823–4) is the only legitimate *Ancylus* s. s. In 1840, Gray (Turton's Manual, new ed., 249) did list *A. fluviatilis* as the only species of *Ancylus* s. s., but if this is the description of a monotypic genus or division then the mention of only one species for a genus or subgenus in any local list does exactly the same thing. This is not a case similar to that outlined in Opinion 6 of the International Commission, because *Velletia* itself was certainly not proposed as a monotypic group as Gray (footnote, p. 250) also included Guilding's "two West Indian species" by page reference. However, it is true that Gray did in 1847 (P. Z. S., 181) incorrectly designate the type of *Ancylus* (although Bourguignat does not cite this publication).

In the second place, even if *Ancylus* Gray (1847) be regarded as a preoccupied genus or subgenus, Bourguignat did not definitely propose his *Ancylastrum* as a substitute. Bourguignat first reviewed Beck's division of *Ancylus* and decided "qu'il devient impossible d'y attacher la moindre importance." Then he discussed Gray's 1840 paper, designated the type of *Velletia*, but mentioned no other species. He also mentioned the similar grouping of l'abbaye Dupuy but was again careful to omit all reference to any species but *A. lacustris*. Finally, he wrote: "Quant à nous, nous adoptons la division du genre en deux coupes, auxquelles nous trouvons des caractères distincts, tirés *de la conformation du test*, et surtout *de celle de l'animal:* caractère que nous formulons comme il suit:—," and proceeded to define his groups *Ancylastrum* and *Velletia*. Again, following the descriptions (p. 63), he admitted "la nature typique qu'il faut reconnaître aux espèces (note plural) que nous prétendons classer dans cette section" (*Ancylastrum*), definitely adopted Velletia Gray (1840) for his second group, but was still careful to omit any recognition of Gray's other group.

As Bourguignat commonly did use the word type in quite the sense of the Code (although he apparently regarded the first species as the automatic type), my own surmise, which appears quite as valid as that of Kennard and Woodward, is that Bourguignat already had *A. cumingianus* in mind as the genotype of his new section. It may be claimed that he incorrectly

believed *Ancylastrum* to be *Ancylus* s. s., but there is no reason to consider it as a substitute for *Ancylus* Gray (1840 or 1847).

Finally to take up the third question, as no type was designated or indicated in the original description of *Ancylastrum*, the first subsequent choice of type is operative. The species later chosen by the author himself, *A. cumingianus* (either date) is included in the original description, according to Opinion 46 of the International Commission, and must be the true type of the genus. *Ancylastrum* does apply to the Tasmanian group and *Pseudancylus* is the correct generic name for *Ancylus fluviatilis* Müller.

THE STATUS OF AMICULA

BY TOM IREDALE*

Loricate nomenclature is still unsettled, as Pilsbry's memorable basic work must be reviewed in the light of the thirty years' intensive research initiated by its publication. In the Bulletin of the U. S. National Museum No. 112, 1921, pp. 197–198, Dall included a Family Cryptochitonidae with three genera, *Cryptochiton* Gray 1847, for *stelleri* Middendorff, *Chlamydochiton* Dall 1878, for *amiculatus* Pallas, and *Symmetrogephyrus* (Middendorff 1848) Chenu 1859, for *pallasii* Middendorff and *vestitus* Broderip and Sowerby. As I am partly responsible for this nomination it is incumbent to record some apparently necessary rectifications. In the Proc. Malac. Soc. Lond., Vol. xi, June, 1914, pp. 128–129, I showed that *Amicula* in 1840 was indeterminable exactly, and that in 1843 it fell as a synonym of *Cryptoconchus*. Apparently this conclusion was accepted without careful criticism but it was not infallible. Twice in the year 1842 *Amicula* had been noted—admittedly in an indirect manner—in an acceptable place, and as these introductions agree there can be no argument as to the recognition of the genus. However it is regrettable that through this observation *Amicula* must replace *Cryptochiton* as used by Dall, and the family name be cited as *Amiculidae*. Thus, Sowerby in the

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second edition of the Conchological Manual, p. 61, included *Amicula* with the definition "A genus formed for the reception of *Chiton amiculatus*, Auct., the valves of which are covered by an integument; so as to be completely hidden externally." Then a good figure is given, No. 507, and in the explanation to the plate on p. 311, *Amicula* is again cited. The figure is that of the shell known as *Cryptochiton stelleri* Middendorff. The second edition was published in 1842, and a reprint with the wording "third edition" appeared in 1846. Either of these may be referred to. Simultaneously Lovell Reeve issued his Conchologica Systematica, and in Vol. ii, p. 9, wrote "In one species of the *Chiton amiculatus* (Plates CXXXII & CXXXIII, Fig. 80), the mantle is expanded entirely over the shell, and it has on this account been separated by Gray for the formation of a new genus, *Amicula*", and on p. 11 *Amicula* is given as the generic name for the shell figured as *Chiton amiculatus*, and this is again the *Cryptochiton stelleri* of Middendorff. This introduction is discussed by Middendorff himself (Mem. sci. nat. Acad. Imp. Sci. St. Petersb., Vol. vi, 1847, p. 96, Feb., 1848) who proposes *Amiculum* as the correct spelling, while rejecting the name.

When Middendorff proposed *Cryptochiton* he divided the genus *Chiton* into two subgenera *Cryptochiton* and *Phaenochiton*. The latter he again divided into two sections *Dichachiton* and *Hamachiton*, and then of the former introduced two subsections *Symmetrogephyrus* and *Ametrogephyrus*. The last named has been cited as a synonym of *Cryptoplax*, its correct location, but the preceding one Dall has made use of as typified by Chenu. Dall many years ago concluded "Middendorff adopted a singular nomenclature, in which the genus was divided into a great number of sections, subsections, &c., so that his work can hardly be classed as binomial in the Linnean sense". This is not accepted today, as Middendorff proves a strictly binomial writer, and his subsections automatically become of higher value and all legitimate. The type of a less group would be available for a higher grouping, but as no type designations seem to have been made except that of *Symmetrogephyrus* it will save trouble and discussion to name as type of *Phaenochiton*

and *Dichachiton* as well as of *Ametrogephyrus*, *Chiton larvaeformis* Blainville. Thus these names will encumber the synonymy of *Cryptoplax*, but otherwise make no confusion.

THE ACANTHODORIDIDAE OF THE CALIFORNIA COAST

BY F. M. MAC FARLAND

The genus Acanthodoris was founded by J. E. Gray in 1850 for the reception of the *Doris pilosa* of O. F. Müller, described originally from the Norwegian coast, but of very wide distribution, having been taken generally in northern European waters and in the Mediterranean, on the coasts of Iceland, Greenland, New England, Alaska and the western coast of British America, while two very doubtful varieties have even been recorded from Tasmania and New Zealand.

The genus diagnosis as extended by Gray ('57) was based upon the careful anatomical and systematic studies of Alder and Hancock ('51, '55), and has been amended somewhat by later writers, especially by Bergh ('79, '80). The type species of the genus is recorded as occurring generally in the northern circumpolar waters, but it is not improbable that a closer study of a larger series of individuals may establish varietal and even specific differences between the Alaskan and the European forms. Specific distinction is much more probable in the case of the two South Pacific varieties of *A. pilosa* (O. F. M.) described by Bergh ('05). One of these has been provisionally identified by Eliot ('07) as being identical with *Ac. mollicella* Abraham. But two valid species seem to be found in European waters, *Ac. pilosa* (O. F. M) and *Ac. subquadrata* A. & H., while Verrill has recorded the genotype and three other species, two of which are undoubtedly varieties only, from the New England coast. The genus seems to reach much greater diversity in Pacific waters as the following list indicates.

1. *Ac. pilosa* (O. F. M.). Kyska Harbor, Popoff Strait; Yukon Harbor (Shumagin Island), Alaska. Bergh ('80).

2. *Ac. pilosa* var. *albescens* Bergh. Kyska Harbor, Alaska.

Bergh ('80); Vancouver region, British Columbia. O'Donoghue ('21).

3. *Ac. pilosa* var. *purpurea* Bergh. Unalaska, Alaska. Bergh ('80).

4. *Ac. coerulescens* Bergh. Nunivak Island, Alaska. Bergh ('80).

5. *Ac. hudsoni* MacFarland. Monterey Bay, California. MacFarland ('05).

6. *Ac. brunnea* MacFarland. Monterey Bay, California. MacFarland ('05).

7. *Ac. rhodoceras* C. & E. San Pedro, California. Cockerell and Eliot ('05).

8. *Ac. nanaimoensis* O'Donoghue. Vancouver region, B. C. O'Donoghue ('21).

To the above list are to be added two new species described in the present paper, *Ac. lutea* and *Ac. columbina*, to which are appended further details of structure exhibited by the other three California species, *Ac. hudsoni*, *Ac. brunnea* and *Ac. rhodoceras*.

Acanthodoris, Gray. 1850.

Acanthodoris Gray, J. E., Figs. Moll. Animals, IV, 1850, p. 103; Guide Moll. British Mus., 1857, p. 207; Alder and Hancock, Monog. British Nudibr. Moll., VII, 1855, p. 43, Appendix p. xvii; Adams, H. & A., Genera Recent Moll. II, 1858, p. 56; Sars, G. O., Moll. Reg. Arct. Norvegiae, 1878, p. 308; Bergh, Gattungen nord. Doriden, Arch. Naturgesch. XLV, 1879, 1, p. 356; Nudibr. Moll. North Pacific, II, Proc. Acad. Nat. Sci. Philadelphia, 1880, p. 88; Monog. d. Polyceraden, III, Verh. k. k. zool-bot. Ges. Wien, XXXIII, 1883, p. 170; System Nudibr. Gasteropoden, 1892, p. 158; Eliot, C., Monog. British Nudibr. Moll. (Alder and Hancock) VIII, 1910, p. 155; MacFarland, F. M., Proc. Biol. Soc. Washington XVIII, 1905, p. 51; Bull. Bureau Fisheries, Washington, XXV, 1906, p. 144; O'Donoghue, C. H., Trans. Roy. Canadian Inst. Toronto, XIII, 1921, 1, p. 168.

Body soft, sub-depressed; notaeum thickly covered with short villi; margin of rhinophore aperture lobed; branchial plumes

few, tripinnate, arranged in a circle; head wide, veliform, expanded into tentacular lobes at the sides.

Armature of labial disk of minute hooks, below with projecting thickenings of the cuticle. Radula rather narrow, rhachis naked, first pleural tooth very large, hamate, external pleurae few (4–8), smaller. Buccal crop connate with pharyngeal bulb.

Glans penis usually armed, vagina usually very long.

ACANTHODORIS HUDSONI MacFarland. Plate II, Figure 1.

Acanthodoris hudsoni MacFarland, F. M., Proc. Biol. Soc. Washington, XVIII, 1905, p. 51; Bull. Bureau of Fisheries, Washington, XXV, 1906, p. 144; O'Donoghue, C. H., Trans. Roy. Canadian Inst., Toronto, XIII, 1921, p. 170; Ibid, XIV, 1922, p. 164.

The body is plump and highly arched, the dorsum is covered everywhere with soft, closely-set, slender papillae. The ground color is a clear, translucent, yellowish white or pinkish white, the papillae, the branchiae, and the clavus of the rhinophores being tipped with lemon yellow, the mantle edged with the same color. The rhinophores are perfoliate with ca. 24 leaves, and are retractile within low sheaths bearing numerous short papillae which are similar to those of the dorsum.

The branchial plumes are five in number, wide-spreading, bipinnate, non-retractile within a sheath, arranged in a circle surrounding the low anal papilla, and including numerous papillae similar to those of the general dorsum.

The labial armature is light yellow, composed of minute hooks in a triangular area on either side of the lower portion of the mouth opening. The ventral plate between these areas is broad, slightly concave, pointed behind and forked in front, the anterior tips projecting freely into the mouth opening. The formula of the narrow radula is 27 (5–6. 1. 0. 1. 5–6). The rhachis is naked, the first pleural tooth (Pl. II, Fig. 1) is strong and compressed, with a quadrangular, basal portion, much thickened below and along its anterior margin, which is prolonged upward in a strong, slightly curved, blunt hook. The posterior portion of the base forms a thinner, plate-like expansion, overlapping externally the first pleural tooth of the suc-

ceeding row. The total height of the tooth averages ca. 0.375 mm., the hook alone measuring 0.135 mm., the ratio of the height of the hook to that of the whole element being nearly as 1 : 2.8, a proportion which holds good in any part of the radula, with but slight variation. No great difference in size is to be found between the younger and older teeth of the same radula in any of the Acanthodorids with which I am familiar, and the proportionate height of the hook in comparison to the total height of the whole first lateral in unworn teeth seems to be a characteristic for each species. The inner margin of the hook bears four to seven well developed denticles midway of its length. In some cases four or five, additional, much smaller denticles may appear below the larger ones, but they are inconstant, and scarcely more than vestiges.

The remaining pleurae, five or six in number, are small and nearly of the same size, 0.090 mm. to 0.105 mm. in length, and somewhat resemble the first pleurae in form, the anterior and dorsal portions being thickened, and prolonged backward to a point, a thin keel-like expansion extending to the tip below and uniting it to the basal part. The outer laterals of *Ac. hudsoni* are larger and better developed than those of the other Californian Acanthodorids, as may be readily seen by comparing Fig. 1 of Plate II with Figs. 4, 7, 8, 9 and 10, which are drawn to the same scale of magnification from corresponding regions of the radulae of the other species.

The vas deferens is ca. 8.5 mm. long, the proximal 3.5 mm. segment of which is thicker and glandular, the remainder more slender and muscular, and passes over into the cylindro-conical preputium, 1.0 mm. in length by 0.4 mm. in diameter, which incloses at its base the short, bluntly conical glans, armed with minute hooks. The uterine duct is very slender and short, passing directly from the anterior, inner margin of the gland complex to the spermatotheca, receiving the duct of the pyriform spermatocyst just before entering the former. The spermatocyst is ca. 0.5 mm. in length, the more spherical spermatotheca 1.0 mm. in diameter. From the latter the vaginal duct, ca. 7.0 mm. in total length, decribes an S-shaped loop, thickens suddenly into a well-marked glandular segment ca.

1.2 mm. in length, with four longitudinal grooves upon its surface, the intervening ridges thus formed being transversely lobulated at intervals. From this portion the vaginal duct passes directly outward, dilating gradually into the vagina.

This apparently rare species was originally taken in shore collecting at Point Pinos, near Pacific Grove, California. It has also been recorded by O'Donoghue ('21, '22) as occurring at Jesse Island, False Narrows and Cardale Point, all in the Vancouver Island region, British Columbia. I have taken an occasional specimen in shore collecting at various places in the near vicinity of Point Pinos, but never in any considerable number.

ACANTHODORIS BRUNNEA MacFarland. Plate II, Figure 7.

Acanthodoris brunnea MacFarland, F. M., Proc. Biol. Soc. Washington, XVIII, 1905, p. 52; Bulletin Bureau of Fisheries, Washington, XXV, 1906, p. 146; O'Donoghue, C. H., Trans. Roy. Canadian Inst. Toronto, XIII, 1921, p. 171.

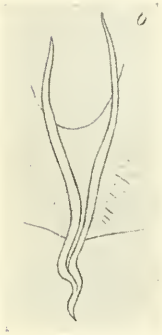
The body outline is oval, broadest in front, the mantle is firm and covered with thickly-set, conical tubercles. The general ground color of the dorsum is brown, flecked with irregular blotches of deep brown or black in varying amount. Scattered spots of light lemon yellow occur between the tubercles, and the mantle is edged more or less completely with the same color. The stalks of the branchial plumes are yellowish-brown, marked on the inner side with two narrow longitudinal lines of dark brown, the tips lemon yellow. The rhinophores are a deep blue-black, tipped with yellowish-white. The under surface of the animal is in general yellow or whitish, the ventral surface of the mantle, the head, the tentacles and sides of the body being sprinkled with fine dark brown or black dots.

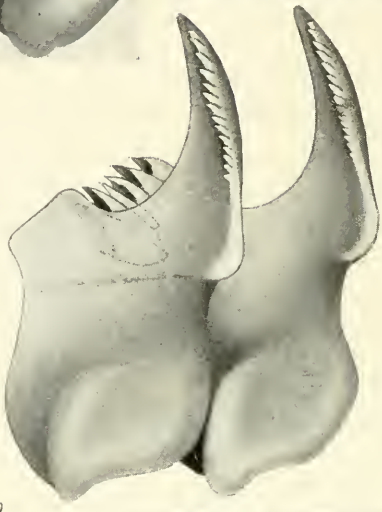
The head is large, being continued laterally into broad, veliform tentacles. The foot is nearly quadrangular, tapering slightly behind into the short tail. The rhinophores are long, the clavus tapering, perfoliate with 20–28 leaves, each edged with a narrow line of white or pale yellow, and retractile within low sheaths with tuberculate margins. The branchial plumes are seven in number, wide-spreading, bipinnate, arranged in an incomplete circle surrounding the anal papilla and about ten

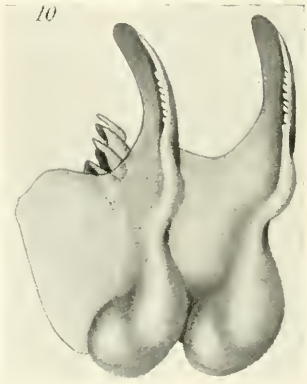
other papillae similar to the dorsal tubercles. The anal papilla is low and its margin is edged with light yellow.

The cuticle of the labial disk is light brown, the labial armature is composed of minute, mosaic-like hooks, arranged in a triangular area on the lower part of either side of the mouth tube entrance, incomplete below, being separated by a single, median cuticular plate, slightly concave longitudinally, its blunt anterior end projecting freely into the mouth opening. The radula formula is 24–28 (6–7. 1. 0. 1. 6–7), its rhachis is very narrow and naked, the first pleural tooth (Plate II, Fig. 7) is large and compressed, its quadrangular base is strongly thickened below and in front, but much thinner behind, the posterior lamina being prolonged upward as a squarish, slightly thickened shoulder. The strong, slightly curved hook, extending upward as a prolongation of the anterior portion of the base, is strengthened on its inner margin by a thickened ridge, which joins the base below in a conspicuous rounded prominence. The inner margin of the hook bears 14–19, well developed denticles along nearly its whole length. The outer pleurae are six to seven in number, similar in general form to the first pleural tooth but much simplified, the anterior basal end and the dorsal margin being slightly thickened, tapering away behind the prolongation, being united below to the base by a thin, keel-like expansion. The total average height of the first pleural tooth is 0.375 mm., the hook alone averaging 0.157 mm., the ratio of hook length to total height being as 1: 2.4 nearly. The outer pleurae range in length from 0.180 mm. to 0.150 mm., the outermost one being the shortest.

The vas deferens is long, attaining 18 mm. in length, the proximal one-half of which is glandular, and closely attached to the anterior genital complex, being set off from the free, distal, muscular portion by a distinct constriction. The preputium is cylindro-conical, 3.0 mm. long by 1.0 mm. in average diameter, the short contained gland is armed with minute hooks. The vaginal duct and vagina are very short, scarcely reaching 6.0 mm. in total length and giving no external evidence of any glandular differentiation such as is found in *Ac. hudsoni*.

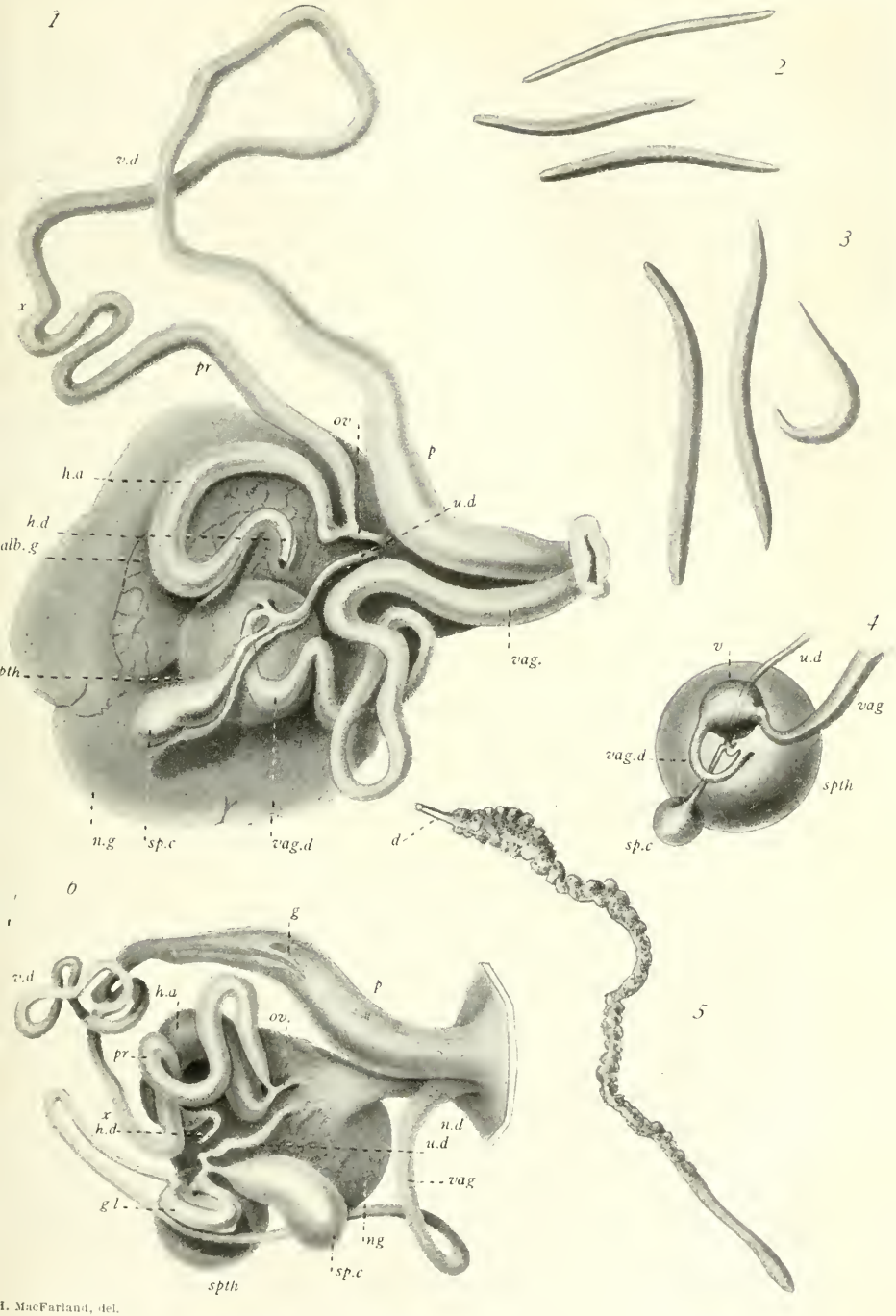






O. H. MacFarland, del

1, ACANTHODORIS HUDSONI. 2, 6, 8, A. LUTEA. 3, 4, A. RHODOCERAS.
5, 9, 10, 11, A. COLUMBINA. 7, A. BRUNNEA.



H. MacFarland, del.

1, 2, 5, ACANTHODORIS COLUMBINA. 3, 6, A. LUTEA. 4, A. RHODOCERAS.

Habitat: Dredged off hard bottom in 5 to 10 fathoms depth off Cabrillo Point (Point Alones) and off the entrance to Monterey Harbor, and from various similar localities near by in Monterey Bay, California. Dredged by O'Donoghue ('21) in about 15 fathoms in Nanoose Bay, and also taken at False Narrows and Mudge Island, Vancouver Island region, British Columbia.

ACANTHODORIS RHODOCERAS Cockerell & Eliot. Plate II, Figures 3, 4; Plate III, Figure 4.

Acanthodoris rhodoceras Cockerell & Eliot, Notes on a Collection of Californian Nudibranchs. Journal of Malacology, XII, 1905, 3, p. 38–39, Pl. VII, Figs. 3, 4.

This species was based upon a single specimen taken at San Pedro, California, and no further study has been published upon it. To the kindness of Dr. Myrtle E. Johnson, of National City, California, I am indebted for two specimens of this form, collected at San Diego, and I have also examined a colored sketch of the living animal made by her.

The animals were soft, flattened oval in outline, and somewhat contracted by the preservative. The largest of the two measured 10 mm. in length, 6.7 mm. in width, and 4.0 mm. in height, being slightly smaller than the one studied by Cockerell and Eliot (12 mm. by 10 mm. by 5 mm.). The pale, yellowish-grey dorsum is everywhere thickly set with conical papillae, the majority of which are tipped with black. Larger and smaller papillae are intermingled, though toward the margins the smaller-sized ones predominate. Near the mantle margin is a nearly continuous, narrow, black line, with scattered indications of a narrow, yellowish edging at intervals beyond it. The rhinophores are almost completely retracted within distinct, low sheaths, which bear four or five short, conical processes of different lengths, some of which are tipped with black. The clavus is perfoliate with thirteen leaves. The branchial plumes are five in number, bi- and tripinnate, flat and spreading, the most anterior one situated in the median line, the others forming with it a star-shaped group. Each of the posterior plumes has a strong, hinder branch, nearly equaling the

size of an independent plume. Several scattered, low papillae, similar to those of the general dorsum, are included within the branchial circlet. No trace of an encircling rim, formed by the union of the surrounding papillae, such as is described by Cockerell and Eliot can be recognized in either specimen.

As indicated by these writers the mantle contains but few spicules, mainly arranged near the margin and the branchial area. In consequence the mantle is decidedly softer to the touch than that of the other Californian species.

The labial disc, oval in outline, bears two, strongly developed, triangular, lateral areas, the labial armature. These are widest below, and narrow somewhat upward, extending nearly to the top of the tube, and are separated below by a narrow area, occupied by the ventral, forked, blade-like process of the cuticle. The labial elements are strongly developed, each consisting of a thickened, squarish base prolonged obliquely upward into a stout process, triangular in side view, and roughly quadrangular as seen from above. The free margin is cleft into a variable number of unequal lobes, as many as ten such being found in the widest elements. The smaller, less developed elements near the posterior border of the armature (Pl. II, Fig. 3, *c*) are reduced to little more than narrow strips, representing the upper, irregular margin of the larger ones (*b*). On the upper, sloping surface of these latter are a variable number of small prominences, not readily distinguishable from the longitudinally striated texture of the element. The labial elements vary in width at the free margin from 0.008 mm., in the anterior border of the armature, to 0.013 mm. in the middle region, and to 0.011 mm. at the posterior border. Typical elements from these three regions are shown in figure 3, *a*, *b* and *c* of Plate II. That the irregular cusp margin is not due to wear is evident, since it appears in the youngest elements of the posterior region as well as in the older ones in front. The vertical height of a typical larger element is 0.137 mm. The ventral space between the lateral armature areas is occupied by a median plate of cuticle projecting freely in front of the armature into the oral opening with its blunt, bifid end. It is 0.336 mm. long and 0.108 mm. in maximum width. The anterior

cleft extends back 0.084 mm. from the blunted tips, the remaining portion forming a single plate. The structure is faintly striated longitudinally.

The narrow radula of the smaller specimen contained 36 transverse rows of teeth, that of the larger but 32; in each the last four or five were incompletely formed, the first eight or ten being free from the sheath and functional. The radula formula is 32–36 (5–6. 1. 0. 1. 5–6). The rhachis is narrow and naked, the first lateral is of the form characteristic of the genus (Pl. II, Fig. 4). It is much flattened laterally, and consists of a somewhat rectangular base, thickened in front, the posterior half being thin and wing-like. The lower, anterior angle of the base is thick and rounded, and tapers upward gradually into the anterior margin of the short, curved, blunt hook. The hook bears from three to six distinct denticles upon its inner margin, about midway of its length, while below these a variable number (two to four) of vestigial ones may occur. The total height of the first lateral in the smaller specimen ranges from 0.228 mm. to 0.249 mm., of which the hook alone makes up 0.084 mm. to 0.093 mm. In the larger the first lateral ranges from 0.278 mm. to 0.339 mm., in total height, the hook alone varying from 0.104 mm. to 0.132 mm., the proportion of height of the hook to total height of the tooth thus being close to the ratio of 1 to 2.6 throughout. The remaining laterals are five to six in number, project obliquely upward and backward, and in general outline resemble the form of the first lateral. They decrease in size outward in the row, and range in length from 0.022 mm. to 0.055 mm. The dorso-anterior margin is somewhat thickened, and tapers to a point above, which is supported ventrally throughout its whole length by a thin expansion of the base. A slight, angular projection, about midway of its length on the inner face, is the only interruption of the smooth outline of this thickened, anterior ridge. The figure of the radula given by Cockerell and Eliot ('05, Pl. VII, fig. 4) does not represent the whole of the base of the first lateral, nor do the contours of the hook, the denticles, nor the remaining laterals agree with my findings. Since the magnification of their figure is not given, size comparisons cannot be drawn.

To the brief notes on the internal anatomy given by Cockerell and Eliot may be added the following observations, measurements, where given, being taken from the 10 mm. specimen. The pseudo-peritoneum is everywhere colorless, the blood gland covers the central nervous system and the posterior curvature of the ingluvies buccalis. The intestine, curving widely to the right, presents the usual small, pear-shaped sack on its right side, close to its origin from the stomach. The liver, ovotestis, and the anterior genital complex are of a uniform greyish color. The hermaphroditic duct passes directly to the right from the anterior end of the hermaphroditic gland to its dilated ampulla, lying in a nearly closed, C-shaped loop upon the inner surface of the complex. Its distal end disappears at the upper, anterior margin beneath the loops of the glandular segment of the vas deferens, which branches off from it just as it enters the nidamental gland. This glandular, or prostatic portion of the vas deferens is deep brown in color, is 6 mm. long and 0.21 mm. in diameter, and rests in a deep groove in the anterior and upper surface of the nidamental gland; its upper loop passing below and in contact with the spermatotheca. It describes two main loops nearly at right angles with each other, a proximal, ventral one, directed downward and forward, and a distal one, upward and backward. Beyond this glandular segment the vas deferens contracts into a more slender, muscular portion, which forms a free loop toward the median plane around the projecting end of the radula sack, below the oesophagus, thence returning outward and upward to dilate into the preputium. The muscular segment is 4 mm. in length and 0.1 mm. in diameter, is thick-walled, and free from pigment, and is marked off from the glandular segment by a slight constriction, in addition to the change in total diameter. The preputium is 3.4 mm. long, cylindrical, and tapers gradually into the vas deferens proximally. Its lining is thrown into numerous longitudinal folds. The inclosed glans penis, at the fundus of the preputium, is short and bluntly conical, 0.12 mm. in length and in basal diameter. No armature whatever can be made out, either upon the glans itself, or lining the preputium, or extending into the vas deferens, nor do serial sections reveal the pres-

ence of small, transparent, hooks as described by Cockerell and Eliot, though the irregular elevations caused by folds in the lining mucosa may simulate such appearances, when seen in a transparent preparation. The epithelium lining the muscular segment of the vas deferens is made up of low, ciliated cells, resting upon a very distinct basement membrane, and surrounded by muscle fibers in two longitudinal layers, with a broader layer of circular muscle fibers between them. In the proximal portion of the muscular segment, just before the glandular division is reached, the epithelial cells are arranged in groups of different heights, varying from 0.014 mm. to 0.035 mm. in height, the corresponding cilia measuring from 0.014 mm. to 0.016 mm. in length. The intervening lumen is thus rendered irregular in outline, being bounded by these varying elevations and depressions. As many as five such may be found in a single cross section, the lumen between them taking on a corresponding stellate outline. When seen through the thick muscular walls these irregularities might be taken for an armature, but none in fact is present.

The vagina and vaginal duct (Pl. III, fig. 4, *vag.*), are exceptionally short, passing straight inward to the upper margin of the anterior genital complex, and measuring but 2.2 mm. from the external opening to the insertion of the retractor muscle. Here the duct bends sharply downward, describes a small wide loop backward, and dilates into a small, vesicle (*v*) in contact with the inner, anterior face of the spermatotheca. This vesicle is almost spherical in form, 0.6 mm. in diameter, and has moderately thick, glandular walls. From its proximal end the vaginal duct (*vag. d.*) continues in a loop upward and backward for ca. 1.5 mm. and opens into the spherical spermatotheca (*spth.*) 1.5 mm. in diameter, upon its upper surface. Close to its entrance emerges the uterine duct (*u. d.*), 1.4 mm. in length, which passes diagonally downward and outward across the anterior face of the spermatotheca, and enters the nidamental gland close to the entrance of the oviduct. It receives the duct of the pyriform spermatocyst (*spc.*) immediately beyond its own emergence from the spermatotheca, and measures 0.7 mm. in length by 0.4 mm. in diameter, its slender

duct being 0.7 mm. in length. The total length of the female channel from the external opening to the spermatotheca is 5.1 mm., and, including the uterine duct from the latter organ to its disappearance in the nidamental gland, is but 6.1 mm. in all. A comparison of figure 4 of Plate III with figures 1 and 6 of the same plate will show the great dissimilarity between the vaginal ducts of *Ac. rhodoceras* and those of *Ac. columbina* and *Ac. lutea*. In this species it is reduced to almost a minimum in length, while in all other species of the genus so far described, with the exception of *Ac. brunnea* and *Ac. hudsoni*, it is extremely long, its great length being hitherto considered as an important generic character. The presence of a penis armature is another generic character here lacking, though it is perfectly obvious otherwise that this species is an Acanthodoris. In those forms of Acanthodoris taken in the Southern Hemisphere the penis armature seems to be also lacking (*Ac. pilosa* var. *Novae Zealandiae* Bergh ('05), ?=*Ac. mollicella* Abraham, Eliot ('07); *Ac. pitosa* var. *pallida* Bergh ('05); and *Ac. metulifera* Bergh ('05)?=*Ac. globosa* Abraham). It is in accordance with these facts that I have modified the genus diagnosis on p. 3 of this paper to cover these exceptions.

Acanthodoris lutea, sp. nov. Plate II, Figures 2, 6, 8; Plate III, Figures 3, 6.

To Dr. Myrtle E. Johnson I am also indebted for a living Acanthodorid, collected by her at Cayucos, San Luis Obispo County, California, Feb. 9, 1921, and for a colored sketch of the living animal. On July 26, 1922, a similar individual was found by me in tide pools of Colorado Reef, off Moss Beach, south of Montara Point, San Mateo County, California. A detailed study of these two specimens has shown that they are undoubtedly distinct from any hitherto described species.

The body is highly arched, nearly equally rounded in front and behind, and of a bluntly oval outline, being slightly broader in the region of the rhinophores than elsewhere. The dorsum is thickly set everywhere with low, conical papillae, the longest reaching 1.5 mm. in length and 0.7 mm. in diameter, near the mid-dorsum, and becoming shorter and more slender

toward the margins. Between the larger papillae numerous smaller ones are scattered. The general ground color of the mantle is orange red, and the papillae are of a deeper shade of the same color. Between the papillae everywhere the surface is sprinkled with minute dots of lemon yellow, the same sprinklings extending up the stalks of the rhinophores, the clavus of which shades into a deep red tip, the leaves being edged with the same color. The ventral surfaces of the foot and mantle are orange yellow. The branchial plumes are greyish-white. The color of the animal is strikingly conspicuous in the tide pool, and at a distance quite resembles a bit of orange peel.

The rhinophores are erect, slightly divergent, the stalk inclining forward, the conical clavus and tip curving backward. The clavus is perfoliate with 26 leaves, united in front by a longitudinal ridge, the whole being retractile within low sheaths bearing a small number of papillae of varying size, similar to those of the dorsum. The branchial plumes are nine in number, low, spreading, non-retractile within sheaths, arranged in a nearly complete circle around the prominent anal papilla, and inclosing likewise some 10–12 papillae, similar to those of the dorsum. The head is broad and veliform, with a broad, shallow, median notch in front, the outer angles being produced into short triangular tentacles, and the whole head margin is edged with the same deep red color as found on the dorsal papillae. The moderately wide mantle margin extends beyond the edge of the foot, except at the tip of the short, blunt tail. The anterior margin of the foot is bilabiate, with a slight, median notch.

The dimensions of the largest Cayucos specimen were: length 22.5 mm., maximum width 14.8 mm., length of foot 18.4 mm., width of foot 11.5 mm., the greatest height of body 6.6 mm. The Moss Beach specimen was somewhat smaller, measuring 17.5 mm. in length, and 9 mm. in greatest width.

The mantle is thick and densely spiculate throughout its whole extent. All the spicules are simple (Pl. III, fig. 3), with no indications of tubercles or branches of any kind such as Meyer and Moebius ('65) figure for *Ac. pilosa*. All are slightly curved, and some of the shorter ones may even assume a hook-

like form. The largest spicule measured reached a length of 1.6 mm., with a maximum diameter of 0.15 mm., another, a more unusual form, was 1.025 mm. in length and 0.025 mm. in diameter.

The pseudo-peritoneum is relatively colorless, a few, minute, pink granules alone being visible in the anterior region. The single, thick, white blood gland overlies the central nervous system and the greater portion of the pharyngeal bulb. The latter organ has the characteristic sessile, muscular crop, or ingluvies upon its anterior portion, composed of two symmetrical halves, separated by a longitudinal depression, the crop reaching a height of 1.0 mm., a length of 2.0 mm. and a width of 1.3 mm. Just beyond the pharyngeal bulb the oesophagus is dilated into a sack-like enlargement. The salivary glands are strap-shaped, the duct being very short, the proximal portion somewhat expanded and lobulate, the distal portion extending through the nerve collar along the oesophagus, and terminating near the anterior end of the stomach.

The cuticle of the labial disk is thin and colorless, the labial armature, occupying the lower sides of the mouth tube at its opening, is colorless and very thin, being much less developed than in other Acanthodorids. It is made up of minute elements (Pl. II, fig. 2) arranged in longitudinal rows, each one somewhat triangular in form when seen in side view, a squarish hook-like process being directed upward and forward from an irregular base. The free edge of the hook is but slightly irregular. The median, ventral, cuticular plate is represented by two slender, diverging, almost thread-like structures (Pl. II, fig. 6), united posteriorly but widely separated at their free, anterior ends. In the degree of development of the whole labial armature this species shows a decidedly rudimentary condition, so much so that the whole structure, and especially the median plate, might be readily overlooked by one not familiar with its presence and appearance in other species.

The radula is colorless or nearly so, the posterior part except the last few rows, taking on a yellow color in the Moss Beach specimen, the Cayucos one being nearly colorless throughout. The smaller individual has 34, the larger 39 transverse rows of

teeth, the dental formula being 34–39 (5–6. 1. 0. 1. 5–6). No median tooth is present on the narrow rhachis. The first lateral (Pl. II, fig. 9) is erect and compressed, the approximately quadrangular base is thickened below and in front, the strong, slightly curved hook is strengthened on its inner border by a strong, thin-edged ridge bearing two to four well developed denticles midway of its length, below which an irregularly serrate margin continues for a short distance, becoming smoother and more thickened below. The total height of the first lateral varies in the smaller specimen from 0.246 mm. in the fifth row, to 0.255 mm. in the 15th, and to 0.264 mm. in the 26th row, the corresponding height of the hook being 0.099 mm., 0.105 mm. and 0.120 mm. respectively, the proportion of hook height to total height being as 1 : 2.48, 1 : 2.42, and 1 : 2.2. In the larger specimen the total height of the first lateral in the corresponding rows is 0.290 mm., 0.300 mm., and 0.277 mm., the respective heights of the hook being 0.120 mm., 0.127 mm. and 0.120 mm., and the relative proportions being as 1 : 2.4, 1 : 2.36, and 1 : 2.3. The average proportions of hook length to total length of the first lateral in the two individuals is as 1 : 2.36 and 1 : 2.35, a rather striking agreement. The outer, lateral teeth vary from five to six in number, and have in a general way the shape of the first lateral. The second lateral is reduced to a thin plate with a slight basal thickening which extends along the dorsal, anterior margin, the ventral, thin lamina extending out to its tip. The remaining laterals decrease in size outwards, and show a more pronounced basal and dorso-anterior thickening, their general form being roughly triangular. The heights of the six outer laterals in a typical row are 0.027 mm., 0.030 mm., 0.024 mm., 0.019 mm., 0.013 mm. and 0.012 mm. for the series from the second to the seventh respectively.

The following description of the essential characters of the reproductive system is based upon the dissection of the larger specimen, the smaller one agreeing with it in all particulars. Figure 6 of Plate III represents the anterior genital cumplex of *Ac. lutea* at a magnification of fourteen times, as seen obliquely from above and within. But slight shifting of the relative

position of the parts has been made, and the nervous and vascular supply and all connective tissue have been omitted. The preputium (*p*) has been displaced forward slightly, the loop of the vaginal duct (*vag.*) at the lower right-hand side of the drawing normally lies transversely above the preputium, being directed forward. It has here been displaced backward and hooked under the tip of the spermatocyst (*sp. c.*), while its free loop at the left has been swung around at right angles to its normal position. The slender hermaphroditic duct curves downward and backward from its origin in the anterior lobes of the ovotestis, joins the anterior genital complex, and dilates into the hermaphroditic ampulla, a whitish, curved tube 7 mm. in length by 1 mm. in diameter. It forms a simple loop downward (Plate III, fig. 6 *h. a.*), curves upward and narrowing again, immediately divides into the oviduct (*ov.*) and the vas deferens (*v. d.*). The former at once enters the fertilization chamber in the nidamental gland, the latter makes a series of loops upon the upper, anterior margin of the nidamental gland, resting in a slight depression in its surface, and being closely bound down to it by connective tissue. In this portion (*pr.*), 10 mm. in length, the vas deferens is characterized by a thick wall, largely made up of tall, glandular epithelium, and may be termed the prostatic segment of the duct. At the point indicated by the letter *x* in the figure the duct becomes free from its attachments to the nidamental gland, narrows considerably, the muscular layers of its wall increase in thickness, while the prostatic, glandular epithelium becomes replaced by a layer of low, ciliated cells. This muscular segment of the vas deferens, 15 mm. in length, forms several free loops in front of the nidamental gland, one of which passes beneath the oesophagus to the left side of the body, where it curves upward and becomes visible from above, immediately in front of the left border of the liver. Returning to the right side the vas deferens dilates into the preputium (*p.*), 4 mm. long with a diameter of approximately 1.0 mm., a hollow muscular sack, at the bottom of which lies the conical glans (*g.*), 0.55 mm. long, and entirely destitute of an armature, nor is any to be found either on the preputium lining, or in the vas deferens. The total length of

the male channel is 29 mm., 10 mm. forming the prostatic segment, 15 mm. the muscular segment and 4 mm. the preputium.

Close to the entrance of the oviduct into the fertilization chamber emerges the slender, uterine duct (*u. d.*), 2 mm. in length. It passes upward over the anterior curvature of the spermatotheca, receives the very short duct of the spermatocyst (*spc.*) and opens into the spermatotheca (*spth.*) at the entrance of the vaginal duct into the latter. The large spermatocyst, in the figure displaced to the right, is 2.1 mm. in length by 1.2 mm. in greatest diameter, and lies transversely upon the upper face of the nidamental gland complex, its distal rounded end being directed obliquely forward and to the left. Below and behind it is the dark, spherical spermatotheca, 1.7 mm. in diameter, overlapped in front by the thick, U-shaped, proximal loop of the vaginal duct, which emerges from the spermatotheca at the same point at which the vaginal duct enters it. This glandular loop (*g. l.*) is represented in the figure as rotated so that its ventral surface is uppermost, the loop at the right hand being normally directed forward and overlying the spermatocyst. The proximal limb of the loop reaches a length of 1.0 mm., its distal one, 1.5 mm. in length, bends to the left, narrows abruptly and is continued backward for a distance of 2.0 mm. as a slender tube, recurves sharply upon itself, passes forward to above the anterior border of the spermatotheca, thence running obliquely outward and forward above the preputium for a distance of 7.0 mm., recurving backward and outward and, dilating gradually to ca. 0.6 mm., it becomes the vagina (*vag.*) and opens externally immediately behind the preputium. The retractor muscle is attached to the posterior loop of the vaginal duct, 11 mm. from its external opening, and 2.0 mm. from its dilatation into the glandular portion. The total length of the female channel is ca. 17.5 mm., which may be divided into vagina, 4.0 mm., thin segment of the vaginal duct 9.0 mm., glandular portion of the vaginal duct 2.5 mm., and uterine duct 2.0 mm.

(*To be concluded.*)

PROTOCONCHS OF CAECUM IN THE MIOCENE OF MARYLAND

BY E. WILLARD BERRY

In examining some material from the Miocene of Jones Wharf, Maryland, for micro-fossils, several tiny specimens of shells with an initial planospiral and a nearly straight annulated cone were found which obviously represented the protoconch and nepionic stage of some species of Caecum. I identify these as *Caecum patuxentium*, the mature shell of which was described by Martin[1] from this locality and horizon in 1904, because of the similarity of the annulations to those on the small end of the mature shell, and because this is the only species of this genus known from Jones Wharf, although a second and somewhat similar species is recorded from the Choptank formation at Greensboro, Maryland. The latter is rare, whereas the former is common at Jones Wharf and at numerous other outcrops of the Choptank formation in Maryland.

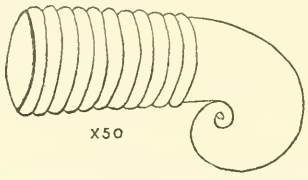


FIG. 1. Early stages of Caecum patuxentium.

Caecum patuxentium is said by Martin to bear a strong superficial resemblance to *Caecum floridanum* Stimpson,[2] differing from the latter in lacking longitudinal markings.

A systematic search would probably disclose protoconchs of Caecum at many Tertiary horizons but so far as I know the only one figured is a poor drawing of *Caecum pulchellum* Brown figured by George W. Tryon, Jr.,[3] in his Conchology, and referred

[1] Martin, G. C., Md. Geol. Survey Miocene, p. 231, pl. 55, figs. 11, 12, 1904.

[2] Stimpson, W., Proc. Bost. Soc. Nat. Hist., IV, p. 112, 1851.

[3] Tryon, G. W., Jr., Structural and Systematic Conchology, Vol. IV, p. 228, pl. 67, fig. 82, 1883.

to the Eocene, the exact horizon and locality not being given. For this reason the following comments seem to be worth placing on record.

The protoconch of *Caecum patuxentium* is entirely smooth and makes three planospiral turns expanding rapidly in diameter to a maximum width of 0.17 and a height of 0.32 millimeters. After the third whorl is completed the smooth protoconch continues for a short distance as a free cone which represents the original apertural region of this stage. Beyond this smooth portion the free and nearly straight cone continues as a strongly annulated portion probably representing the nepionic stage. It bears ten or more strong, regular, close-set annulations similar to those of the mature shell.

The genus Caecum appears in the Tertiary and contains over 100 existing and about 25 extinct species, being widely distributed and most abundant in the later Tertiary and Recent.

YOICHIRO HIRASE

A short time ago we received word from Mr. Shintaro Hirasé, son of Mr. Y. Hirasé, of his father's death, which occurred May 25, 1925.

Few men, and certainly no one in Japan, have done more to advance the study of Mollusca than Mr. Hirasé. His enthusiasm, perseverance and sacrifice for the science of conchology is best described in the following paragraph, taken from a leaflet asking for aid and support for his Conchological Museum:

"At first I used to go myself collecting in different parts of the empire, but finding it very difficult because of a weak constitution, to adapt myself to circumstances, I decided to employ and educate two or three assistants, in spite of limited means, and send them not only to all parts of Japan, but also to many far away groups of islands, such as the Bonins, Loochoos, the Kuriles and Formosa; also to Korea and China, with the view of collecting material for study. The expenses of these explorations amounted to a considerable sum. As I pursued my studies I needed books and magazines which cost a great deal. On the other hand I tried to publish a conchological magazine

and a few other books in order to announce to the public the results of my investigations and to disseminate information of newly discovered facts. In all of this work I spent one-half of my property."

In the NAUTILUS, Vol. 27, June, 1913, was published an account of the opening of The Hirasé Conchological Museum, with a picture of the building. It certainly required great enthusiasm and optimism to establish a purely conchological museum,—the only one of the kind ever attempted.

From 1907 to 1909 Hirasé published the "Conchological Magazine," Vols. I and II and four numbers of Vol. III appearing. It contains many fine illustrations. In 1914 he started a unique and interesting publication in Japanese style, "Illustrations of a Thousand Shells." Three volumes were published, containing 300 beautiful colored figures. The "Album of the Hirasé Conchological Museum" and the "Terebridae of Japan" are some of his publications.

Through his publications, correspondence and the distribution of shells Hirasé became known to conchologists all over the world. His investigations resulted in a great increase in the scientific knowledge of the Japanese fauna. Many species of mollusks have been named in his honor, and a peculiar genus of land snails, *Hirasea*, perpetuates his name.

W. H. HARGRAVES

This name was more familiar to the conchologists of the past generation than to those of the present age, so the decease of this past-time collector needs a little remark. Angas inaugurated conchological study in the Australian colonies about seventy years ago, first in South Australia and then in New South Wales. His record of the fauna of the latter colony incited the closer attention of a little band of workers of whom Cox, Hargraves and Brazier were the most noted. These submitted their finds to Angas, who recorded them, but later Cox and Brazier described many novelties themselves. After getting together a magnificent collection, Hargraves was stricken with illness, and

to secure health sold his treasures on condition they were deposited in a colonial museum. The choice fell on the Australian Museum, Sydney, the name of the donor being Mr. Thomas Walker, a generous benefactor of science in our early days. This happened as long ago as 1877, but Hargraves in 1907 was elected a trustee of the Museum, and always, when he attended the trustees' meetings, used to look over the shells still on view with the labeling "Hargraves Collection." Born as long ago as 1839, Hargraves attended a trustees' meeting on Feb. 6 this year, and was delightfully normal until he passed away on April 9; the week before his death sending farewell messages to the staff of the Museum.

Many novelties were described from his collecting; the genus *Hargravesia*, *Voluta hargravesi* Angas and *Placostylus hargravesi* Cox being named in his honor.—Tom Iredale.

R. MURDOCH

Some thirty years ago there arose in New Zealand a malacologist whose earliest papers stamped him as an accession whose name would be enrolled among the few great workers in our branch. Fine anatomical work was supplemented by excellent descriptive ability, while clear judgment was associated with splendid draughtsmanship. Obviously peerless in Neozelanic conchological circles, business duties necessitated strict attention to mundane affairs, and science perforce was sacrificed, while loss of his collection by fire probably disheartened him. After some years his interest was revived and attention to fossil forms was given in conjunction with Dr. Marshall. Now just as we were hoping to receive the best of news, his death was reported, and through his previous silence has been overlooked as it took place as long ago as November, 1923.

His communications were to the Proceedings of the Malacological Society of London and the Transactions of the New Zealand Institute. He was one of the earliest members of the former body, having joined in the first year of its existence.

The genus *Murdochia* was named by Ancey, and several species were named in his honor by Hedley and Suter. Mur-

doch demands attention from even the purely American conchologist, as he dissected and described the anatomy of the American genus *Ashmunella*, in the Journ. Malacology, Vol. VIII, pp. 73–85, 1901, accompanying a paper by Ancey in that connection.—Tom Iredale.

NOTES AND NEWS

Zonitoides arboreus (Say) in Mammoth Cave, Kentucky. — During a recent collecting trip in Kentucky, the greater part of one day was spent in Mammoth Cave collecting insects, arachnids and other small cave animals. In one of the lower levels of the cave, and fully a mile from the main entrance, a few snails were found beneath pieces of rotting wood on the floor of the cave. Dr. H. A. Pilsbry has identified these snails as *Zonitoides arboreus* (Say), a common species of the open. The cave specimens appear to differ in no respect from those found outside and it is probable that they have been recently and accidently introduced.—Sherman C. Bishop, Albany, N. Y.

Zonitoides arboreus Deleterious to Cane.—Discovery that a small snail causes the root-rot disease, which has almost wrecked the sugar-growing industry of Louisiana, is announced by Dr. E. W. Brandes, plant pathologist of the U. S. Department of Agriculture. Hitherto the mollusks, to which order the snails belong, have remained unconvicted as crop criminals. Dr. R. D. Rands, of the Office of Sugar Plant Investigation, however, found that *Zonitoides arboreus*, a snail so tiny that it easily travels through the tunnels made by earthworms, attacks the cane roots. As many as 150 of these little snails have been counted about the roots of a single plant. In their attack they leave minute cavities which are invaded by microorganisms from the soil. These latter complete the injury and often kill the plant. It is estimated that there is a reduction in crop tonnage of at least twenty per cent. directly traceable to the subterranean attack made by these snails whose sweet tooth is literally cutting off the Louisiana cane industry at the roots.—*Science Service*, in *Science*, Sept. 25.

Station of Ferrissia oregonensis (Clessin).—This ancylid I found to be quite common in Yakima River, Yakima, Washington. It occurred on almost every large stone in running water, whether deep or shallow, in swift current or slow. I picked over a hundred from one stone. They were found also on submerged wood, twigs and leaves, and on living water plants.

I found *Planorbis callioglyptus*, *Pisidium randolphi* and a few *Physa nuttalli* living in tiny pools, filled with leaves and with only very little water, in the woods near the river. The *Planorbis* was abundant. Specimens of the *Ferrissia* collected today (March 15) are sent.—Walter J. Eyerdam.

Additional Records for Lymnæa auricularia. Dr. Wendell O. Gregg, of Montrose, California, and Prof. Junius Henderson, of Boulder, Colorado, have called our attention to three additional records of this species in the United States, all of which were omitted from our article in the April, 1925, number of the Nautilus. They are as follows:

Long, Nautilus, Vol. 26, 1912, pp. 27–29; Pennsylvania.
Clapp, Nautilus, Vol. 26, 1913, pp. 116–117; Massachusetts.
Gregg, Nautilus, Vol. 37, 1923, p. 34; California.

—G. Dallas Hanna and H. Walton Clark.

Collecting in Kentucky.—We take the liberty of printing a recent letter dated Munfordville, Ky., Sept. 20, 1925:

Dear Dr. Pilsbry: Yours of the 10th sent to me here. We are spending a day or so at this place (Rio) to get a more complete set of mollusks for a paper that I hope to get to The Nautilus some time this winter. Yesterday I collected over 100 lbs. of *Unionidæ* and had to carry them over a mile through the woods, up hill, and across the Green River four times.

I have had wonderful collecting so far. All of the streams are very low. Even the Cumberland was so low that I waded across in two feet of water! It is lower than ever known before. It is a crime to leave *tons* of *Unionidæ*. I found a bed of live shells yesterday over 300 feet long and 50 feet wide; they were so thick that I could have filled a freight car. In the Cumber-

land the pearl hunters had piled up the open shells four and five feet high—all perfect shells. I thought last year that the Clinch River was good collecting, but it was nothing to the Cumberland, though of course the Clinch was richer in species.

I am getting enough *Pleuroceridæ* for all hands, and in due season I will send on a set of each.

There is nothing in the line of land shells. There has been no rain in this section since June; every thing has burned up; many of the trees have lost all of their leaves, especially on the knobs where the soil is thin. But the *Pleuroceridæ* and *Unionidæ* are here for the taking!

Please pardon this hasty letter. I will drop you a line later letting you know how we came out.—William J. Clench.

PUBLICATIONS RECEIVED

Note on the Atlantic Coast species of Plicatula and Note on the Species of Petricolaria of the Eastern Coast of the United States. By W. H. Dall. (Proc. Biol. Soc. Wash., Vol. 38, p. 90, 1925). For the *Petricola dactylus* of authors not Sowerby the author proposes *Petricolaria pholadiformis* var. *lata.* The true *dactylus* is native of the West Coast of South America. *Petricolaria* is only a subgenus of *Petricola.*—C. W. J.

Notes on the Genus Physa with descriptions of three new subspecies. By Wm. J. Clench. (Occas. Papers Mus. Zool., Univ. Mich., no. 161, pp. 1–10, 1, pl. May, 1925).

A new species of mollusk (Dentalium hannai) from Lower California, with notes on other forms. By Fred. Baker. (Proc. Calif. Acad. Sci., 4 ser. Vol. 14, pp. 83–87, pl. 10, 1925).

The Pliocene mollusca of Great Britain. By F. W. Harmer. (Palaeontographical Society, Vol. 2, pl. 4, pp. 857–900, and pl. 65 with a systematic and general index to the entire volume). This completes this valuable work, being supplementary to S. V. Wood's Monograph of the Crag Mollusca.

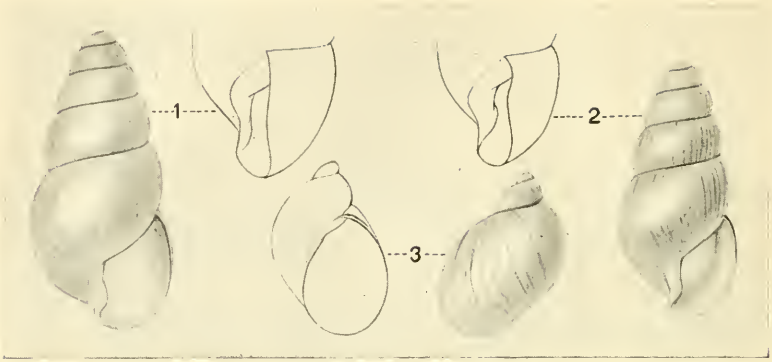


FIG. 1. LEPTINARIA BEQUAERTI, Page 79.
" 2. LEPTINARIA PARANA.
" 3. SUCCINEA MANAOSENSIS.

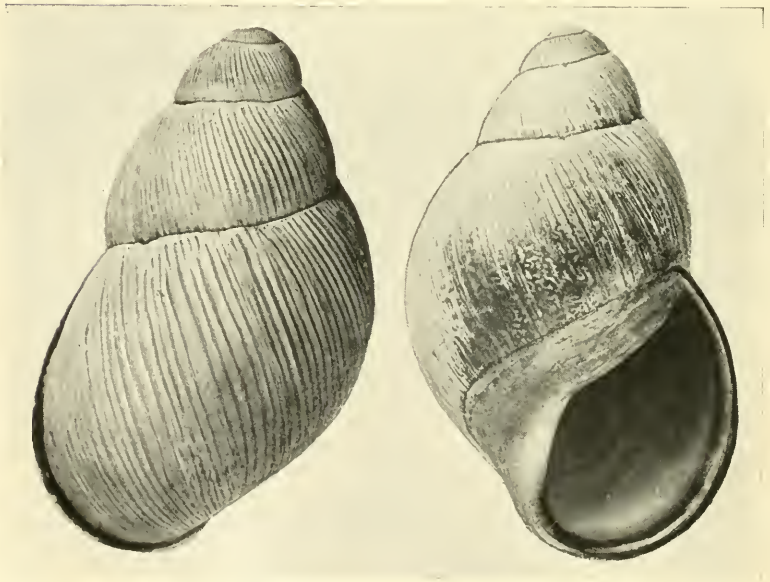


FIG. 4. BORUS LORENTZIANUS, Page 77.

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HELIX NEMORALIS L. IN LYNCHBURG, VA.

BY DR. A. E. ORTMANN

Collecting last summer on the Piedmont Plateau in Virginia, I spent several days in Lynchburg, Campbell Co., and discovered there, on Sept. 2, '25, a flourishing colony of the European *Helix nemoralis*. One of the known localities for this species is at Lexington, Rockbridge Co., Va., about 50 miles (by rail) farther up the James and North River valley. I collected it here myself on June 7, '12, in gardens and along the road that leads down to North River.

I have not been able to find any report concerning this Lynchburg colony, although Mr. S. C. Crawford, of the Zoology department of the University of Pittsburgh, who has been teaching at Lynchburg College, informed me that he collected this snail there about 1922. I publish this note chiefly with the view of possibly obtaining further information about this case: it may be a separate introduction; it may be a transplantation from Lexington (as it has been transplanted from Lexington to Knoxville, Tenn.); or we may have here a natural dispersal from Lexington down the river-valley. But probably this latter case is out of the question.

Mr. Crawford found his specimens on the campus of the College (valley of Blackwater Creek), northwest of the town. My

locality is in the valley of Ivy Creek, falling into James River in Lynchburg, and forming a deep ravine, which is spanned by a bridge connecting Main St. and Rivermont Ave. In the ravine are the tracks of the Norfolk and Western R. R. running close to steep, in part vertical, bluffs of gneiss, facing the north. The bluffs are largely covered with a vegetation of various trees, and, at the base, with tall weeds. They are more or less damp on account of a number of springs, the water trickling down at many places.

Helix nemoralis lives here, right under the bridge, and some distance up and down along the railroad, among the weeds, and preferably in crevices and nooks of the damp rocks. Many dead shells are found in the narrow ditch along the railroad tracks. When on the rocks, the snails are rather conspicuous on account of their bright colors. I have seen over a hundred living specimens, but unfortunately comparatively few were mature: I secured about half a dozen with the peristome fully formed. The seven pecimens at hand have the following banding formulas: 4 specimens: 12345; and one each with: 123(45), (12)3(45), 10345. They all have pale yellow ground-color and very dark-brown, almost black, bands. As a whole, they are strongly contrasted with my specimens from Lexington, which have lighter brown bands, and have more frequently one or more bands suppressed. The Lynchburg specimens are all of good size, but rather thin-shelled. On account of this, and to my dismay, a number of those collected (about two dozen) had been crushed when they arrived in Pittsburgh.

There was a number of native Gastropods associated with these snails. I collected the following: *Polygyra tridentata juxtidens* Pils. rare; *P. albolabris* (Say), scarce; *P. appressa* (Say), abundant; *P. thyroides* (Say), rare; *P. thyroides buculenta* (Gld.), fairly abundant; *Gastrodonta ligera* (Say), very abundant.

ON AMICULA AND CRYPTOCHITON

BY WILLIAM H. DALL

In the NAUTILUS (No. 2, p. 47) Tom Iredale has a communication on the status of *Amicula*. His conclusions, on a careful review of the literature, seem open to doubt, as will presently appear. Gray's original remark in relation to this genus in the Synopsis of the British Museum (Ed. 42 A, p. 127, 1840) is as follows:

"*Acanthochites* is peculiar for having a bundle of bristles placed on each side of the valves; and *Chitonellus* and *Amicula* differ only in having the valves nearly hidden in the mantle of the animals."

I agree with Iredale in considering this remark as insufficient to establish a genus, but it shows clearly that Gray's idea was that of a chiton-like *vesitus* or *amiculatus* of Pallas, and not one in which the valves are *entirely* covered by the mantle as in *C. stelleri*.

Now in the second edition of Sowerby's Conchological Manual, 1842, we find:

"*Amicula*. A genus formed for the reception of *Chiton amiculatus* Auct. the valves of which are covered by an integument, so as to be completely hidden externally. Page 311, fig. 507. *Chiton amiculatus*. *Amicula* Gray."

Then follows (p. 128):

"*Cryptoconchus* Blainville. A genus composed of species of *Chiton* the valves of which are covered by the integument, as *Chiton porosus* of Burrows. *Ch. amiculatus* of Pallas. Page 311, fig. 507. *Chiton amiculatus*. *Amicula* Gray."

Now neither in *C. amiculatus* Pallas, nor in *C. porosus* Burrows, are the valves completely hidden by the integument, in spite of Sowerby's statement. Furthermore, figure 507, which Iredale assumes to represent *C. stelleri*, is a crude drawing of a dry shell which is represented with nine valves and, except for the fact that the draughtsman has overlooked the minute, exposed apices of the valves, at once recalls *C. vestitus*. In the preface to the fourth edition of the work the auther states that "many synonyms have been rectified, some dates have been

given, a few doubtful or unnecessary definitions have been altered or expunged," etc.

On page 62, we find:

"*Amicula* Gray, 1842. A genus formed for the reception of *Chiton vestitus*, the valves of which are covered by an integument so as to be almost hidden externally. Plate XXIV, fig. 507."

On page 334, the reference to Plate XXIV, fig. 507 (which has not been altered) reads "*Chiton amiculatus. Amiculu* Gray."

Gray, in his article on the Genera of the Family Chitonidae (Proc. Zool. Soc. London, 1846, p. 66), defines *Amicula* thus: "Exposed part of valves small, subcordate, as broad as long; mantle bristly." On page 69, to "*Amicula* Gray, Syn. 1840" he adds "*Amicula vestita. Chiton vestitus* Sby., Zool. Journ. IV, p. 368, 1829."

In 1847 (Proc. Zool. Soc. London, 1847, p. 169), Gray again links *C. vestitus* with *Amicula* as the sole cited example.

In H. & A. Adams' Genera of Recent Mollusca, 1854, *C. amiculatus* Pallas, *emersonii* Conthony, *pallasii* Middendorff, and *vestitus* Sowerby are the species ranked under *Amicula* Gray.

In short, there is no question but that Gray's genus was intended to cover species with apically exposed valves, and the illustration of it by an inaccurate figure can hardly be taken as sufficient to overthrow the obvious intention, however we may be addicted to extreme technicalities.

In conclusion one may smile at the identification as a "strictly binomial writer" of one who names a new species *Chiton Phaenochiton Dichachiton Symmetrogephyrus pallasii.* The early confusion between *C. amiculatus* and *C. stelleri* was not remarkable when we consider that the former was known only by the work of Pallas, while the latter was not rare, and few authors consulted Pallas's work but were content to copy the figures and blunders of earlier writers.

BORUS LORENTZIANUS DOERING

BY T. D. A. COCKERELL

In the Santa Barbara hills, in the Province of Jujuy, Argentina, we found the tropical biota present in a dilute form, but still with magnificent trees and quantities of green parrots, talking a language we did not understand. We were much disappointed not to see any monkeys. In all the forested country near our camp at Sunchal, *Borus* shells were scattered about in considerable abundance. Here and there we saw *Epiphragmophora tucumanensis* Döring and two species of *Bulimulus*.

It was winter in that country, and much of the time we were in a cold mist, condensing on the tree above our tent and producing a monotonous drip, drip, drip, all night. Not a single *Borus* was seen alive, but some of the shells were fresh enough to show all the essential characters. At the museum in Buenos Aires, I had ascertained that this *Borus* was *B. lorentzianus* Döring, of which Pilsbry states in the Manual of Conchology, Vol. 10, 1895, that he could obtain neither specimens nor description. Subsequently in Vol. 14, 1901, p. 125, he gave a translation of Döring's description from *Periodico Zoologio*, II, 1877, 255. No figure appeared until 1924, when illustrations were published by Joaquin Frenguelli in an article on *Borus* shells in kitchen-middens of the Rio San Roque indigenes.[1] These illustrations of the weathered and corroded shells of the mounds show the shape but not the characteristic sculpture, and are thus inadequate for conchological requirements. I saw specimens from as far south as Tucuman. In the Buenos Aires Museum, the shells are labeled *B. oblongus* var. *lorentzianus*, but on comparison with veritable *B. oblongus* (Müller) from Trinidad (*F. W. Rohwer*), they appear to represent a distinct species, which may be diagnosed as follows:

[1] Frenguelli's article appeared in Boletin Acad. Nacional de Ciencias en Córdoba (Rep. Argentina), XXVI, pp. 404, 418; *Borus* "*oblongus* var. *lorentzianus*" on pp. 409–416, figs. 3, 4, 8, 9. I owe the reference to this article to Dr. Pilsbry.

Borus lorentzianus Döring. Pl. IV, figs. 4, 4*a*.

Shell ovate, solid, the conical spire very obtuse at apex, after the fashion of *B. capillaceus* (Pfr.); upper whorls regularly and closely ribbed, as in *B. oblongus*, with a delicately wavy surface, and faint indications of spiral lines; whorls 5½–6, last whorl without the wavy or granulated surface; peristome and parietal callus bright rose-color; outer lip reflexed. Alt. 68–75 mm., diam. about 38 to 43 mm.; length of aperture about 38 mm.

The general characters, especially the obtuse spire, are quite uniform, and the closest alliance seems to be with *B. capillaceus* from the Upper Amazon, which von Martens considered a variety of *B. oblongus*. There is no particular affinity with *B. intertextus* (Pilsbry) from Corumbá; the latter locality is much nearer, about 500 miles northeast, though in quite a different sort of country. Both *capillaceus* and *intertextus* have very much finer riblets on the upper whorls than are seen in *lorentzianus*.

BRAZILIAN MOLLUSKS COLLECTED BY DR. JOS. BEQUAERT

BY H. A. PILSBRY

The records following are supplemental to the list given by Dr. Bequaert in pp. 4 and 5 of this volume.

Gastrocopta servilis (Gld.) Carvoeiro. This is the minute pupillid mentioned (in Nautilus for July, p. 4) as abundant on decaying bones. In the Manual of Conchology two named forms of *G. servilis* are described as *G. servilis oblonga* (Pfr.) and *G. s. riisei* (Pfr.), both characterized by small or partly deficient teeth. The Carvoeiro form varies from practically typical *servilis* to forms with smaller teeth, the basal and the upper-palatal folds either present, minute or wanting. The same forms occur in a set from Lake Jiloa, Nicaragua. It appears that the two forms *riisei* and *oblonga* are so intimately connected with *servilis* in some lots that their discrimination seems hardly worth while.

Pupisoma dioscoricola insigne Pils. On leaves, Manáos.

Succinea manaosensis n. sp. Pl. IV, fig. 3.

The shell is rather short, of 2½ very strongly convex whorls, warm buff colored. The surface is dull, the penult and first part of the last whorl weakly striate, but dorsally on the last whorl it becomes coarsely, irregularly plicate. The aperture is symmetrically ovate, acute above.

Length 8.75 mm.; diam. 5.2 mm,; length of aperture 6.3 mm.

Manáos. Type and four paratypes No. 135042 A. N. S. P.

Leptinaria bequaerti n. sp. Pl. IV, fig. 1.

The shell is imperforate, oblong-turrited, pale, subtransparent gray, somewhat whitish towards the summit. Surface very glossy, weakly marked with growth lines. The spire has nearly straight outlines, the apex rather obtuse; whorls are strongly convex. The columella is straight, with a low, subvertically spiral lamella below. Outer and basal margins of the peristome thin. Outer lip arching forward slightly.

Length 6 mm.; diam. 2.8 mm.; length of aperture 2.5 mm.; 5½ whorls.

Carvoeiro, Brazil, at the confluence of the Rio Negro and the Rio Branco collected by Dr. Jos. Bequaert. Type 185055 A. N. S. P.

This species was found in some abundance. It is larger than *L. charlottei* F. Baker, and decidedly broader in figure. It differs from *L. parana* by having the columella straight above the spiral lamella.

Leptinaria parana n. sp. Pl. IV, fig. 2.

The shell is imperforate, shaped much like *L. bequaerti* but differing by the following features: The peristome is bordered within with a callous band. The outer lip arches strongly forward. The columella is shorter, thicker, and in an oblique view in the mouth it is much more strongly sigmoid.

Length 5.1 mm.; diam. 2.5 mm.; length of aperture 2.2 mm.; 5½ whorls.

Wtinga, a suburb of Para, Brazil, coll. by Prof. William Beebe. Type 112596 A. N. S. P.

Leptinaria charlottei Fred Baker, from Camp 39 of the Madeira-Mamoré Railroad in Matto Grosso, is a more slender shell with less arched outer lip and less strongly twisted columella.

LAND SNAILS OF BREATHITT COUNTY, KENTUCKY

BY E. G. VANATTA

Following is a list of mollusks collected by students in the neighborhood of Quicksand, Breathitt Co., for Professor W. D. Funkhouser, and sent to Dr. Pilsbry for study.

A single specimen taken by Professor C. R. Crosby of Cornell University is similar to *Polygyra hirsuta* except that it shows a distinct tooth at the junction of basal and outer margins of the lip, unlike any other *Stenotrema*. The good series of *P. hirsuta* sent by Prof. Funkhouser from the same place shows only the normal form, so that in all probability the toothed shell is merely a pathologic individual.

The specimens of *Polygyra tridentata* are about equally divided between those with normal teeth and others with the teeth very small. Probably two stations are represented.

Part of the *Gastrodonta gularis* are almost imperforate.

Polygyra andrewsæ Binn.
Polygyra sayana Pils.
Polygyra albolabris Say
Polygyra thyroidus Say
Polygyra appressa linguifera Lam.
Polygyra tridentata Say
Polygyra inflecta Say
Polygyra stenotrema Fér.
Polygyra hirsuta Say
Polygyra fraterna Say
Haplotrema concava Say
Omphalina cuprea Raf.
Mesomphix laevigata Pfr.
Mesomphix inornata Say
Polita indentata Say
Vitrea capsella Gld.
Vitrea multidentata Binn.
Euconulus chersinus Say
Zonitoides arborea Say
Gastrodonta intertexta Binn.
Gastrodonta ligera Say
Gastrodonta gularis Say
Gastrodonta interna Say
Gonyodiscus patula Desh.
Lymnæa humilis Say

NOTES ON MARINE MOLLUSKS FROM THE YUCATAN PENINSULA, MEXICO

BY NORMAN E. WEISBORD

The Yucatan peninsula, jutting out as it does, into the warm waters of the Gulf of Mexico and the Caribbean sea, affords an admirable site for the accumulation of a profuse molluscan life, and what with the stormy and heavy surf during the months of October to February (caused by the prevailing north winds or *nortes* as they are called) piling the shells on shore, the beaches are literally and "littorally" covered with marine Mollusca; the fauna, however, is more abundant than diverse. The sands along the entire coast are composed of the fragments of broken and disintregated shells and hence is nearly pure lime with but little silica or other minerals present. The fauna is typical of that found in the southern Gulf regions and appertains nearly exclusively to the Caribbean province although a few forms are known to be also Panamic in distribution. Nearly all of the species occur in the West Indies, while many are common to Florida and northern South America.

Opportunity for collection was afforded during the course of g eologic reconnaissance of the peninsula. Following are the localities from which the specimens were obtained:

Progreso, Yucatan.
Campeche, Campeche.
San Lorenzo, Campeche.
Seibaplaya, Campeche.
Chenkan, Campeche.
Between Chenkan and Sabancuy, Campeche.
Very Cruz, Vera Cruz.

With the exception of that at Campeche, which is rather rocky and covered with weeds, the beaches are all uniformly sandy. Throughout, the character of the fauna is fairly constant, though a number of species are more abundant in some localities than in others. Thus at Progreso *Chione cancellata* Linné is found by the thousands, but a short distance from it or

more to the west and south, the form is superseded by other more prominent ones. *Strombus pugilis* Linné is rare at Progreso but very abundant at San Lorenzo and to the southwest of Seibaplaya. The great majority of *Cerithea* were found at Campeche where they abound amongst the rocks which are shallowly covered with water. *Labiosa* (*Raeta*) *canaliculata* Say occurs south of Chenkan but I have seen it north of there but rarely. This alternate sporadic and profuse occurrence of certain forms is due to local variations in habitat.

The ancient Mayas, whose remnants of a superior civilization are still extant, used some of these shells as offerings to their gods. In dredgings from the sacred well at Chichen-Itza I found several fragments of *Marginella* together with the jade, copper and golden trinkets which were thrown in with the sacrificed virgins. Legend tells us that before casting these various tokens into the water they were slightly chipped or broken so as not to rival the perfection of the virgins.

For determinations I have drawn freely on the works of Dall, Tryon, Baker and Maury, the latter having recently revised the nomenclature of the Gulf species.

The following forms have been collected:

Arca occidentalis Philippi. Progreso, San Lorenzo, Chenkan, near Sabancuy.

Arca umbonata Lamarck. Fairly common along the entire coast but locally more abundant at Progreso, Chenkan and Sabancuy.

Arca (*Barbatia*) *adamsi* (Shuttleworth) Smith. Rare, Progreso, San Lorenzo, Chenkan.

Arca (*Noetia*) *ponderosa* Say. Not uncommon along the coast.

Arca (*Scapharca*) *secticostata* Reeve. Rare, Progreso, Chenkan, Sabancuy.

Arca (*Scapharca*) *auriculata* Lamarck. Progreso, Sabancuy.

Arca (*Scapharca*) *transversa* Say. Abundant. The larger forms are more quadrate than the smaller ones.

Arca (*Argina*) *campechensis* Gmelin. One specimen from Campeche.

Glycimeris pectinata Gmelin. Chenkan, Sabancuy.

Ostrea cristata Born. Campeche.

Pecten (*Plagioctenium*) *gibbus* Linne. Not a common shell as in other localities, Chenkan.

Pecten (*Chlamys*) *ornatus* Lamarck. A single specimen from near Sabancuy.

Plicatula gibbosa Lamarck. Common.

Anomia simplex D'Orbigny. Progreso, Chenkan.

Mytilus (*Hormomya*) *exustus* Linne. Several immature specimens, Campeche, San Lorenzo.

Cardita (*Carditamera*) *floridana* Conrad. Very abundant and vari-colored.

Chama macerophylla Gmelin. Progreso, Chenkan, near Sabancuy.

Echinochama arcinella Linne. Abundant at Chenkan.

Lucina chrysostoma (Meuschen) Philippi. Between Chenkan and Sabancuy.

Codakia orbicularis Linne. Several very large specimens, Progreso, Sabancuy.

Codakia (*Jagonia*) *orbiculata* Montagu. A single shell from San Lorenzo.

Phacoides pectinatus Gmelin. Commonly known as *Lucina jamaicensis*. Campeche, Sabancuy.

Phacoides (*Lucinisca*) *nassula* Conrad. Rare, Progreso.

Cardium (*Trachycardium*) *isocardia* Linne. Progreso, Campeche, Chenkan, Sabancuy.

Cardium (*Cerastoderma*) *robustum* Solander. Progreso.

Cardium (*Fragum*) *medium Linne.* One specimen from Chenkan.

Cardium (*Laevicardium*) *serratum* Linne. Some of the forms are very highly colored, Campeche, Chenkan, Sabancuy.

Cardium (*Laevicardium*) *serratum* var. *laevigatum* Lamarck. More quadrate than typical *serratum*. Campeche, Chenkan.

Dosinia (*Dosinidia*) *elegans* Conrad. Chenkan, Sabancuy.

Macrocallista maculata Linne. Very variable in size and coloration. Progreso, Chenkan, Sabancuy.

Antigona listeri Gray. Rare, Chenkan.

MARINE BIOLOGICAL LABORATORY WOODS HOLE LIBRARY MASS.

Chione cancellata Linne. Extremely abundant along the coast.

Anomalocardia brasiliana Gmelin. Progreso, Campeche (common), Sabancuy. Usually labeled *A. flexuosa* Born. Variable in the amount of posterior attenuation and character of ribbing.

Venus campechiensis Gmelin. Progreso, Chenkan, near Sabancuy.

Petricola (*Rupellaria*) *typica* Jonas. A single imperfect specimen from San Lorenzo.

Tellina lineata Turton. Campeche (rare), Chenkan, between Chenkan and Sabancuy. Colored either white or dark pink.

Macoma (*Cydippina*) *brevifrons* Say. Rare, Chenkan.

Semele proficua Pulteney. Scarce, near Sabancuy.

Semele purpurascens. Scarce, near Sabancuy. Characterized by its oblique incisions.

Donax variabilis Say. Uncommon, Chenkan.

Mulinia lateralis Say. Fairly abundant toward the south of the peninsula, Chenkan to Sabancuy. Somewhat thinner shelled and more elongated than the more northerly shells.

Labiosa (*Raeta*) *canaliculata* Say. Near Sabancuy.

Bullaria occidentalis Adams. Progreso, Campeche, Chenkan, Sabancuy.

Bullaria striata Bruguiere. Differs from *B. occidentalis* Adams in having a more widely open umbilicus and with both ends of the shell concentrically striated.

Melampus coffeus Linne. Rare, Campeche, San Lorenzo.

Terebra (*Hastula*) *cinerea* Born. Two worn specimens, Chenkan.

Conus floridanus Gabb. Progreso, Chenkan, Sabancuy.

Conus proteus Hwass. Progreso, Chenkan, Sabancuy, south of Seibaplaya.

Conus verrucosus? Hwass. Several immature and imperfect specimens in the collection may be referrable to this species.

Drillia (*Crassispira*) *harfordiana* Reeve. Chenkan. Also more widely known from Panama. I cannot distinguish

any differences between the Yucatan shell from that of Panama with perhaps the exception of a slight variance in coloration. Not unlike *D. albinodata* and others of the *D. zebra* group but much larger.

Cancellaria reticulata Linne. Chenkan, near Sabancuy.

Cancellaria (*Trigonostoma*) *tenera* Dall. Rare, Chenkan.

Oliva litterata Lamarck. Campeche, Chenkan, Sabancuy. Considered as synonymous with *O. circinata* Lamarck by Maury.

Olivella nivea Gmelin. Rare, Chenkan, Sabancuy.

Marginella apicina Menke. Progreso, Campeche, Chenkan, near Sabancuy.

Marginella guttata Dillwyn. Common, Progreso, Campeche, Chenkan, between Chenkan and Sabancuy.

Marginella labiata Valenciennes. Abundant all along the coast.

Marginella oblonga Swainson. Scarce, Progreso, Chenkan.

Marginella (*Volvaria*) *avena* Valenciennes. Rare, Chenkan.

Turbinella scolymus Gmelin. Young forms from Progreso, Chenkan and Sabancuy.

Mitra (*Pusia*) *gemmata* Sowerby. Campeche. A rare and prettily colored shell.

Fasciolaria tulipa Linne. Progreso, Chenkan, near Sabancuy.

Leucozonia cingulifera Lamarck. Chenkan, Sabancuy. Variable in attenuation of spire and nodulation.

Busycon pyrum Dillwyn. Progreso, Chenkan, Sabancuy.

Busycon perversus Linne. Progreso, Campeche, Chenkan, between Chenkan and Sabancuy.

Melongena corona Gmelin. Campeche.

Cantharus tinctus Conrad. Chenkan.

Alectrion vibex Say. Chenkan.

Alectrion ambigua? Montagu. One worn shell, Campeche.

Columbella avara Say. Rare, Progreso.

Columbella mercatoria Lamarck. Abundant along the coast.

Murex (*Phyllonotus*) *pomum* Gmelin. Progreso, Chenkan, Sabancuy.

Murex (*Chicoreus*) *salleanus* Adams. A single shell from Chenkan.

Muricidea floridana Conrad. Campeche. Maury considers this synonymous with *M. ostrearum* Conrad.

Trivia suffusa Gray. Progreso.

Pyrula papyratia Say. Rare, Chenkan.

Strombus pugilis Linne. Campeche, Chenkan, south of Seiboplaya (abundant and very highly colored), San Lorenzo, near Sabancuy. Not as prominently spinose as the northern varieties.

Strombus gigas Linne. Progreso.

Cerithium algicola Adams. Campeche.

Cerithium atratum Born. Progreso, Chenkan, near Sabancuy.

Cerithium ferruginem Say. Campeche, Chenkan.

Cerithium minimum septemstriatum Say. Campeche.

Cerithium minimum nigrescens Menke. Campeche.

Cerithium minimum Gmelin. Campeche.

Cerithium variabile Adams. Campeche, Chenkan, between Chenkan and Sabancuy.

Modulus modulus Linne. Campeche.

Vermicularia spirata Philippi. Chenkan, near Sabancuy.

Crepidula fornicata Linne. Progreso, Chenkan, Sabancuy.

Crepidula alculeata Gmelin. Progreso, Chenkan, San Lorenzo.

Crepidula plana Say. Rare, Progreso.

Crucibulum verrucosum? Reeve. This form is found abundantly along the coast but am not assured of its identity with the above.

Natica canrena (Linne) Morch. Chenkan, Sabancuy.

Polynices (*Neverita*) *duplicata* Say. Chenkan, between Chenkan and Sabancuy.

Sinum perspectivum Say. Scarce, Chenkan.

Turbo castaneus Gmelin. Rare, Progreso, Chenkan.

Astralium cubanum Philippi. Near Sabancuy. Closely allied to *A. olfersi* and *A. americanum*.

Astralium longispinum Lamarck. Progreso, Chenkan.

Nerita tessellata Gmelin. Very abundant especially around Lerma where it is collected by fishmongers and used as food.

Chlorostoma (*Omphalius*) *fasciatum* Born. Campeche, Chenkan.

Lucapinella limatula Reeve. Uncommon, Chenkan.
Fissuridea alternata Say. Progreso, Chenkan, near Sabancuy.
Fissuridea alternata Say var. *dysoni* Reeve. Chenkan, Sabancuy.
Subemarginula octoradiata (Gmelin) Adams. Scarce, Campeche, San Lorenzo.

UNIONIDAE FROM THE REELFOOT LAKE REGION IN WEST TENNESSEE

BY DR. A. E. ORTMANN

The following report is founded primarily upon the collections made by the writer during the "Geo. H. Clapp Expedition to Reelfoot Lake" of the Carnegie Museum in August, 1924. It includes localities in Reelfoot Lake proper;[1] further in the Bayou de Chien, Walnut Log, Obion Co. (tributary entering the lake near its northern end; and North Fork Obion River, Union City, Obion Co. (a tributary of the Mississippi receiving the waters of Reelfoot Lake).

[1] Blue Basin, Lake Co. (N. W. shore); Bluebank, Lake Co. (South end); and Samburg, Obion Co. (East shore).

This material was supplemented by specimens collected in July, 1925, in the lake (near Samburg) by Mr. Steven B. Crossley, who acted as guide during the expedition of 1924. The latter specimens arrived in part alive.

From this region we possess only one previous list of mussels, collected by S. N. Rhoads in 1895, and published by H. A. Pilsbry and S. N. Rhoads (P. & R.) (Proc. Acad. Philadelphia 48, 1896, pp. 500–506). The Reelfoot Lake shells of this list are from Samburg, Obion Co.; but there are a few also from Wolf River, Raleigh, Shelby Co. (near Memphis), a locality probably with ecological conditions similar to those of Obion River. Most of the species of this list have been found by myself, and several have been added. The following enumeration includes all forms known from these western parts of Tennessee (Mississippi Embayment and Mississippi Bottoms).

1. *Fusconaia flava* (Rafinesque).—Union City, one gravid female, with the diameter of 47% of the length. This is a typical representation of the species (See Ortmann, Proc. Americ. Philos. Soc. 59, 1920, p. 282), and has also a reddish-brown epidermis and reddish nacre.

A species belonging generally to small streams, found preëminently in the Ohio drainage (and that of the Great Lakes). Present in small streams tributary to the Cumberland; entirely absent in the Tennessee drainage.

2. *Fusconaia flava trigona* (Lea).—Union City, one male and one female, with the dia. of 58 and 57%. Thus these specimens are distinctly more swollen than the specimen of *flava*, and fall under the var. *trigona*, as defined by me. Since their obesity is not very great, and since the beaks are not remarkably elevated, they could not be called var. *undata* (Barnes).

This form represents *F. flava* farther downstream in the Ohio system. It is also represented west of the Mississippi, but these forms require further study.

3. *Megalonaias gigantea* (Barnes).—Union City, abundant.

A species of the larger rivers of the Interior Basin.

4. *Plectomerus trapezoides* (Lea).—Union City, one female. Reported by P. & R. from Samburg.

A southern species, which seems to have its metropolis in the tributaries of the Mississippi in the Mississippi Embayment.

5. *Amblema costata* Rafinesque.—Union City, not rare. The specimens at hand have the diam. of 44 and 45%, which thus is below the maximum obesity (47%) given for this form by Ball (Ecology 3, 1922, p. 134). As I have pointed out (Amer. Midland Natural. 9, 1925, p. 333), this should better be changed to a higher figure.

Widely distributed in the Interior Basin, preferring the smaller streams.

6. *Amblema peruviana* (Lamarck).—Not found by myself, but reported by P. & R. (as *U. plicatus* Lea.) from Samburg.

This is a form of very large rivers and quiet water, possibly passing into the *A. costata* of the smaller rivers. Its presence in Reelfoot Lake should be expected.

7. *Quadrula pustulosa mortoni* (Conrad).—Union City, abund-

ant. Reported from Wolf River, Raleigh, Shelby Co., by P. & R. (as *U. turgidus* Lea).

This form differs from typical *pustulosa* of the Ohio, Cumberland and Tennessee drainages in the subquadrate outline, the well developed posterior ridge, and—in its typical phase, as found, for instance, in Louisiana—in the color of the epidermis, which is ashy-greenish-brown, without the broad green ray of *pustulosa* (in which the epidermis is more or less tawny). Yet no sharp line can be drawn between the two forms. From northern Arkansas (White River and St. Francis River) I have intergrades, chiefly in the color of the epidermis, which frequently show the broad green ray of *pustulosa*, and also approach it in shape (more rounded, with indistinct posterior ridge). The specimens from Obion River are much like those from northern Arkansas: their shape is that of *mortoni*, but the color is more tawny and has, at least in younger specimens, the broad ray.

This seems to be a southern representative of *Qu. pustulosa* in the Mississippi Embayment. It is very variable, and not yet fully understood. *U. nodiferus* Conr. (Jackson, La.) apparently is an absolute synonym. *Qu. sphærica* (Lea) and *refulgens* (Lea) seem to be local phases of this, belonging to the Amite, Pearl and Chickasawhay (Pascagoula) drainages in Louisiana and Mississippi.

Quadrula pustulosa (Lea) has been reported by P. & R. from Samburg. I have not seen specimens from Reelfoot Lake, and do not think that the true *pustulosa* is found in the lake; probably it is *mortoni*.

8. *Quadrula quadrula* (Rafinesque) var.—Bluebank, Lake Co. I have seen dead shells at Samburg, and S. B. Crossley has sent four splendid specimens (alive, males) from the lake. P. & R. report this, as *U. asperrimus* Lea, from Samburg.

The dia. of the six specimens at hand is between 55 and 60%, and thus they are considerably more obese than normal *quadrula* (Dia. under 52%, see: Ortmann, Amer. Midl. Natural. 9, 1925, p. 331). In height they agree fairly well with the latter (77 to 86%), and also in the moderate development of the tubercles, as well as in color (brownish, with greenish tints,

when younger). They are by no means the southern *Qu. aspera* (Lea), as might be suspected from the locality, for the latter has smaller, more numerous and more crowded tubercles, and is generally less swollen. *Qu. quadrula fragosa*, which is rather swollen, has stronger tubercles, and is more elevated.

My specimens resemble the form *cantraryensis* Utterback (Lake Contrary, St. Joseph, Mo., see: Amer. Midl. Natural. 4, 1916), but the latter has much weaker sculpture. I should call attention to the fact that the figure of the smaller specimen of *U. nobilis* Conrad (Journ. Acad. Philad. 2, 1854, pl. 27, f. 2) closely resembles my two younger specimens. This figure has been declared by Simpson (1914, p. 323) to represent *U. apiculatus* Say, but I believe that the two figures given by Conrad (figs. 2 and 3) might very well belong to the same form, fig. 3 probably representing an old, somewhat deformed specimen (possibly a female?). The forms grouping around *Qu. quadrula* (*quadrula*, *fragosa*, *aspera*, *nobilis*, and also *apiculata*) and their interrelations require revision.

Qu. quadrula is abundant in larger rivers of the Interior Basin, passing southward into *aspera*. It seems to develop several local or ecological modifications.

9. *Quadrula verrucosa* (Rafinesque).—Union City, abundant. Reported by P. & R. from Wolf R., Raleigh, Shelby Co.

A species of immense distribution in nearly all of the Mississippi drainage, and also in streams running to the Gulf, from Alabama to Texas. I found several specimens with purplish nacre, a color seen chiefly in the southern part of the range.

10. *Arcidens confragosus* (Say).—Union City, two males. Reported from the lake at Samburg by P. & R.

A species centering in its distribution in the Mississippi Embayment, and thence advancing into the lower, sluggish parts of the larger rivers, frequently found in ponds and lakes.

11. *Lasmigona complanata* (Barnes).—Union City, one male.

The center of the area occupied by this species lies in the middle of the Interior Basin, in the quieter waters of the largest rivers, and also in ponds, lakes and canals. Under favorable conditions, the range extends well towards the headwaters, chiefly in a northerly direction, where it has crossed over into

the St. Lawrence drainage, and is said to extend even into the Mackenzie Basin. It also goes down the Mississippi Embayment to the Gulf Coastal Plain in the Alabama drainage.

12. *Anodonta imbecillis* Say.—Bayou de Chien, Walnut Log, not rare. Two specimens from the lake have been sent by S. B. Crossley. Reported from the lake at Samburg by P. & R.

Of tremendous distribution from Texas to the Great Lakes region, and over the Gulf Coastal Plain to the southern parts of the Atlantic Coastal Plain. Chiefly in quiet waters.

13. *Anodonta grandis gigantea* (Lea).—Lake at Bluebank and Samburg; Bayou de Chien at Walnut Log. Reported from Samburg by P. & R. (as *grandis* Say). S. B. Crossley has sent about twenty immature specimens.

The specimens collected correspond most closely to the var. *gigantea*, which is merely an ecological form, belonging to ponds and lakes with muddy bottom. It is close to, possibly identical with, *A. corpulenta* Cooper, and *A. stewartiana* Lea (chiefly the young ones to the latter).

The range of *A. grandis* is enormous, corresponding largely to that of *A. imbecillis*, also preferring mostly quiet waters. It is extremely variable, and has developed a great number of local and ecological races, which are not yet fully understood.

14. *Anodonta suborbiculata* Say.—I found only one young specimen in the Blue Basin of the lake, but S. B. Crossley has sent several larger ones. Reported from Samburg (P. & R.).

Apparently a typical lake-form, centering in the middle of the Interior Basin, where the three large rivers unite, and extending down the Mississippi Embayment to Louisiana.

15. *Truncilla truncata* (Rafinesque).—Not found by myself, but reported by P. & R. from Samburg (as *U. elegans* Lea).

Widely distributed over the Gulf Plain, through the Mississippi Embayment and the Interior and Great Lakes Basins, found under very diverse conditions, in swiftly running water as well as in ponds and lakes. It is to be expected in Reelfoot Lake.

16. *Leptodea fragilis* (Rafinesque).—Union City, one female. Also in Wolf R., Raleigh, Shelby Co. (P. & R., as *U. gracilis* Barnes).

On the Gulf I lain from Alabama to Texas, up the Mississippi Embayment into the Interior Basin and that of the Great Lakes. Also this species is found in both running water and in lakes.

17. *Proptera purpurata* (Lamarck).—Not found by myself, but reported from Wolf R., Raleigh, Shelby Co. (P. & R.).

Represents the *P. alata* (Say) of the Interior Basin in the South, on the Coastal Plain from Alabama to eastern Texas. In the northern parts of the Mississippi Embayment (in Missouri), it seems to pass into *P. alata*. It is common in the state of Mississippi, just south of the locality in western Tennessee.

18. *Carunculina parva* (Barnes).—Lake at Bluebank, one gravid female. Reported from Samburg (P. & R.).

My specimen is typical, and sharply distinct from those of the next species.

Most abundant in the central parts of the Interior Basin, crossing over to the Great Lakes. Known also from southern localities as far as Texas. There are related forms in Alabama, Georgia and northern Florida, which may be simply local races of this. The species prefers quiet waters.

19. *Carunculina texasensis* (Lea).—Lake at Bluebank and Samburg, not rare. Reported from Samburg by P. & R.

Generally supposed to represent *C. parva* in the South, from Texas and Alabama up to the Mississippi Embayment to southern Illinois and Indiana. It may intergrade with *C. parva*, but in Reelfoot Lake the two are perfectly distinct. A species of quiet waters.

20. *Micromya lienosa* (Conrad).—Union City, two males.

Distribution very similar to that of *Car. texasensis*, chiefly in its northward extension. In Alabama, however, it goes considerably more eastward (to Georgia and S. Carolina), although in a somewhat different form (*concestator* Lea). Also in its main range it varies a good deal; my specimens agree very well with others from Mississippi and Arkansas; they are of good size, have the epidermis blackish, and the nacre whitish or with purplish tint.

21. *Ligumia subrostrata* (Say).—Lake at Bluebank and Sam-

burg, not rare, a number sent by S. B. Crossley. Reported from Samburg by P. & R.

From the Coastal Plain (Texas to Alabama) up the Mississippi Embayment into the central parts of the Interior Basin, restricted to quiet water of large rivers, ponds and lakes.

22. *Lampsilis anodontoides fallaciosa* (Smith).—Union City, very abundant. Probably the record for Wolf R., Raleigh, Shelby Co., given by P. & R. (as *U. anodontoides* Lea) refers also to this variety.

All my specimens represent the typical *fallaciosa*. At the time, when Pilsbry and Rhoads published their list, this had not been separated from the main species. The latter and the variety are almost co-extensive in their range, which covers the central parts of the Interior Basin, the Mississippi Embayment and the Coastal Plain from Texas to Florida. However, in the latter region, the form *fallaciosa* seems to be absent, while other local forms turn up. Elsewhere, *fallaciosa* seems to be the form of quiet water and sandy-muddy bottom, while *anodontoides* is found in stronger current and gravel. Thus my specimens are from the sandy-muddy bottom of Obion River, with slowly, but steadily flowing water.

23. *Lampsilis ovata satura* (Lea).—Union City, one male.

This form, which is not a direct descendant of *L. ovata*, but rather of *L. ovata ventricosa* of the Interior Basin, seems to be characteristic of the Mississippi Embayment, south to Louisiana and eastern Texas, and intergrades in northern Arkansas with *ventricosa*. On the other hand, in the state of Mississippi, it gradually changes into *L. excavata* (Lea), typical for the Alabama River drainage. The present locality is the most northern record for *satura* east of the Mississippi.

If we add to the above list the record of *Strophitus rugosus* (Swainson) from "Horn Lake Creek, Shelby Co., Tenn.", given by Lea[1] (as *Anodonta shæfferiana*), we have here a complete list of all Naiades ever reported from the direct drainage of the Mississippi River in western Tennessee. The contrast

[1] There is a station "Horn Lake" on the Ill. Centr. R. R. just across the state line, south of Memphis, in De Soto Co., Miss.

with the fauna of other parts of the state of Tennessee is remarkable. The number of forms is surprisingly small, and yet there is a high percentage of shells, which are peculiar to the Mississippi Embayment. This fact should be kept in mind, for it is important in the study of the development of the Naiad faunas of North America.

THE ACANTHODORIDIDAE OF THE CALIFORNIA COAST

BY F. M. MAC FARLAND

(*Concluded from page 65*)

ACANTHODORIS COLUMBINA sp. nov. Plate II, Figures 5, 9, 10, 11; Plate III, Figures 1, 2, 5.

Six individuals of this form were collected at low tide in reef pools at Moss Beach, near Montara Point, San Mateo County, California, on July 26, 1922. A second collecting trip to the same locality on May 3, 1923, failed in securing any more of this interesting new species.

The animal has the plump, nearly oval outline characteristic of the Acanthodorids. The foot is completely covered by the wide, thick border of the mantle, save for the tip of the tail. The dorsum is covered everywhere with closely-set, slender, tapering papillae, reaching 1.5 to 2.0 mm. in length, and giving it a soft, velvety appearance. This is rather deceptive, however, for the body is firm to the touch, the mantle being everywhere filled with slightly curved calcareous spicules (Pl. III, fig. 2) interlacing in various directions. Each papilla is reinforced by a group of spicules, mainly lengthwise in arrangement, and nearly filling it. These extend well down into the dorsum, and are strengthened by others added at lower levels, so that each papilla contains a firm, skeletal framework, precluding anything more than slight movement of its apical half. The margins of the rhinophore openings are similarly reinforced.

The ground color of the dorsum is a dusky, brownish mauve. The papillae are tipped with lemon yellow, and each one is more or less deeply shaded with brown, and none of them are

white. The stalks of the rhinophores are brownish sprinkled with small, lemon-yellow spots, similar ones being also found between and on the plates of the clavus, which is otherwise of a deep, vinous-red color, as are also the tips of the branchiae. The upper margins of the main stalks of the plumes and the beginnings of their main branches bear a row of small, dead white, rounded nodules. A narrow, continuous band of lemon yellow edges the ventral margin of the mantle in all six specimens. The ventral surface is much paler, everywhere tending toward a yellowish grey. In alcohol the yellowish marginal line disappears, but the other colors, though lighter, are preserved for some time.

The largest specimen measured, while living and crawling freely, 32 mm. in length, 15 mm. in width, and 9.0 mm. in height, the others being but slightly smaller.

The head is of the usual shape, wide and expanded in a veliform manner, and produced at the lateral angles into widely triangular, or even squarish tentacles, directed backward. The foot margin is single in front, and bluntly tapering behind, extending but slightly beyond the mantle when crawling.

The rhinophores are directed outward and forward, are perfoliate with from 22 to 26 leaves, and are surrounded by low, thin-edged sheaths into which they are incompletely retractile. The sheath margins bear a small, variable number (six to ten) of longer and shorter processes, resembling those of the general dorsum.

The branchial plumes are nine in number, low, spreading, and bipinnate, and are arranged in a circle surrounding the anal papilla, the area bearing numerous low papillae, similar in form and color to those of the general dorsal surface. The spicules (Pl. III, fig. 2) are slender structures, pointed at both ends and slightly bent as a rule. The largest measured 0.9 mm. in length, though the average length is considerably less. No traces of branching were found.

The pseudo-peritoneum is sparingly sprinkled with minute black dots, mainly in the anterior region. The thick-walled muscular ingluvies is borne upon the anterior, upper face of the pharyngeal bulb as a low, hemispherical projection, 1.5 mm.

in length. 1 mm. in height, and 1.75 mm. wide. Its median line is sharply marked by a longitudinal band of muscle, forming the bottom of a shallow groove between the two symmetrical halves. Behind the radula sack projects freely for a distance of 1.2 mm. Immediately behind the ingluvies the oesophagus issues, surrounded by the nerve collar, bearing just in front of the latter a well marked, dilated sack-like portion, ca. 2.0 mm. in diameter. The salivary glands open into the bulb at either side of the exit of the oesophagus. They are long, strap-like organs (Pl. III, fig. 5), the short, slender duct (*d*) being followed by a thickened, somewhat lobulate portion, which is in turn followed by a more slender division, terminating near the entrance of the oesophagus into the stomach. Their total length is ca. 5.8 mm., and the greatest diameter at the widest portion is 0.4 mm.

The labial disk, surrounding the slit-like mouth opening, bears an armature of minute, cuticular plates, interrupted below, and extending laterally nearly to the upper side of the opening, the area so covered being triangular in form, with the base ventro-posterior and the apex dorso-anterior. The elements of the armature (Pl. II, fig. 5) are blunt hooks, triangular in side view, ca. 0.009 mm. high, the length of the base being 0.012 mm. From above each hook is broadly rectangular in outline, the squarish cusp directed forward, 0.068 mm. in width, the margin being irregularly denticulate, or in some cases with a single median notch. The elements of each lateral area are arranged in from 30 to 35 rows, parallel to the long axis of the mouth tube; the longest rows in the widest part of the armature contain some 26 elements, the number decreasing toward the top of the tube, the lowermost rows, next to the median plate also having few and rudimentary hooks. The labial armature is interrupted below by a median, ventral cuticular plate, projecting freely beyond the opening of the oral disk. This structure (Pl. II, fig. 11) is 0.36 mm. long and 0.097 mm. wide at its broadest, posterior part. It is slightly concave on its upper surface, and is finely striated longitudinally, the striae gently diverging anteriorly. The anterior free end is bifurcated by a narrow notch or cleft, extending back in

the median line 0.09 mm., the two tips thus formed being irregularly blunted and worn.

The radula is of the typical, narrow, deeply folded form characteristic of the genus. The radula formula is 40–43 (5. 1. 0. 1. 5), the anterior teeth are colorless, the more posterior ones toward the tip of the radula sack, but not the youngest ones, take on a yellowish tint. The median tooth is absent, the rhachis being very narrow and naked, but the first lateral tooth (Pl. II, fig. 10) is quite large and strong. The large, compressed, basal portion is roughly quadrangular in lateral outline, its anterior and ventral margin being strongly thickened, the posterior part is prolonged backward as a thin lamina, which overlaps the anterior portion of the succeeding first pleural tooth of the next row. The upper posterior border is rounded. From the anterior, thickened portion of this base arises a stout hook, slightly curved backward. Its tip is blunt, the posterior margin is thin, while the anterior edge is thickened and is strengthened by a strong ridge on its inner face which dies away toward the tip, and bears a series of six to eight small, but well marked denticles, merging below into slight irregularities of the ridge margin. Figure 10 of Plate II represents the first laterals of one-half of the seventh and eighth rows as seen from the median side, and fig. 9 of the same plate shows the first laterals of the 28th and 29th rows as seen in front view. A comparison of these figures with similar ones on the same plate of the other species discussed in this paper, all drawn at the same magnification, will render evident many differences of detail, proportion, and relative size, which are here omitted for the sake of brevity. The total height of an average first lateral is 0.324 mm., the height of its hook being 0.096 mm., the proportion of height of hook to total height being nearly as 1 to 3.4, this proportion holding true within small limits throughout the whole radula. The remaining laterals, five in number (Plate II, fig. 10), are much compressed, and lie at about the level of the base of the hook of the first lateral in the functioning part of the radula. Each is a flattened plate, somewhat approximating the outline of the first. The second is especially thin, and is faintly seen behind the first

lateral, the remaining four have their antero-dorsal margins thickened, and prolonged upward and backward into a hook-like process, which, however, does not project freely, as in the first lateral, but is continuous ventrally and posteriorly with the thin, upward expansion of its base, the whole tooth being somewhat triangular in form.

The reproductive system is composed of the ovotestis, closely covering the most of the surface of the liver, the anterior genital complex, consisting of the large, white, nidamental gland, nearly inclosing the much smaller, yellowish, albumen gland, and of the various ducts of the system. Since the relations of these parts are of decided significance from a systematic as well as from a morphological standpoint, I give in Fig. 1 of Plate III an accurate camera drawing of the anterior complex as seen obliquely from above and within. No displacement of the ducts has been made other than is necessary to bring out their relationships, but connective tissue, nerves and blood vessels have been dissected away for the sake of clearness. The short and slender hermaphroditic duct (*h. d.*), coming from the ovotestis, dilates into the hermaphroditic ampulla (*h. a.*), a whitish tube, 0.8 mm. in diameter, forming a simple loop nearly 7.7 mm. long, resting in a shallow groove upon the inner anterior face of the albumen (*alb. g.*) and the nidamental (*n. g.*) glands. At its anterior end it narrows again and divides into the vas deferens (*pr.*) and the oviduct (*ov.*), the latter opening at once into the fertilization chamber, concealed in the gland complex at the border of the albumen gland.

The vas deferens is divisible into two distinct portions, a proximal segment (*pr.*), with glandular walls, 12.5 mm. in length, attached closely to the anterior and superior surfaces of the nidamental gland, and a slightly more slender, distal, muscular portion, 17.5 mm. in length, the loops of which are free from the glandular mass, extending in front and to the left of it beneath the oesophagus. In figure 1 of Plate III, the proximal, glandular, or prostatic portion (*pr.*) extends to the point indicated by *x*, and is here represented as partly straightened out, after having been freed from its close attachments to the anterior and upper faces of the gland complex, the loops between

pr. and *x* normally lying above the bifurcation of the hermaphroditic duct. The distal end of the vas deferens dilates into the preputium (*p.*) some 4.5 mm. in length, by 1.0 mm. in diameter, an eversible, muscular sack with longitudinally folded, inner lining of ciliated epithelium. At the bottom of this sack is found the very short and blunt glans penis, scarcely more than a rounded eminence. It appears to be entirely destitute of the armature of small hooks usually held to be characteristic of Acanthodorids in general, nor are any such hooks to be found lining the vas deferens. Throughout the muscular segment of the tube it is lined with ciliated epithelium, resting upon a strong basement membrane, in certain regions folded longitudinally. The total length of the male channel is 34.5 mm.

Close to the entrance of the short oviduct (*ov.*) into the gland complex the slender, uterine duct (*u. d.*) emerges. After a short course of ca. two mm., it receives the slender duct of the spermatocyst (*sp. c.*), and almost immediately opens into the spherical spermatotheca (*spth.*). The spermatocyst is of an elongated, pyriform shape, 2.0 mm. in length by 1.0 mm. in greatest diameter, and lies obliquely upon the dorsal surface of the complex. The thin-walled spermatotheca, 2.0 mm. in diameter, lies midway of the dorsal border of the anterior genital complex, partly concealed by the spermatocyst and the loops of the overlying vaginal duct. The latter duct (*vag. d.*) arises from the spermatotheca very close to the entrance of the uterine duct, in fact appearing to be continuous with the latter. It rapidly increases in diameter, its walls becoming very glandular and longitudinally folded, and forms a complicated series of loops upon the upper, inner and anterior faces of the spermatotheca, and then passes outward, dilating into the vagina (*vag.*), which opens externally immediately behind the preputium in the genital sinus. From the left turn of its most distal loop a rather strong retractor muscle extends diagonally inward and backward. The glandular and plicated walls of the tube are limited to the more closely coiled, proximal loops, the remainder and the vagina proper possessing muscular walls. The total length of the vaginal duct averages nearly 16 mm., the vagina itself is 4 mm. long, with a diameter of 0.6 mm.

In general ground color this species resembles *Ac. nanaimoensis* O'Donoghue, of the Vancouver region. Through the kindness of Professor O'Donoghue I have had the privilege of studying a fine specimen of the Vancouver form, and find that the two are clearly distinct species. While both agree in the general mauve color of the mantle, and in the port-wine shade of the branchial tips, the dorsal papillae are white or yellowish in *Ac. nanaimoensis*, while in *Ac. columbina* they are brownish, and tipped with lemon yellow. The Californian species also has the lower mantle margin edged with a narrow line of lemon yellow, and the rhinophores are sprinkled with small flecks of the same color. The following tabulatiou summarizes a number of other distinctive characteristics:

	Acanthodoris nanaimoensis O'D.	*Acanthodoris columbina*
Rhinophore leaves	28–30	22–26
Labial elements	In 70–80 rows	In 30–35 rows
Median plate of labial armature	0.66 mm. long by 0.225 mm. wide	0.36 mm. long by 0.097 mm. wide
Radula formula	35(6–7.1.0.1.6–7)	40–43(5.1.0.1.5)
Average height first lat.	0.525 mm.	0.324 mm.
Average height hook first lateral	0.226 mm.	0.096 mm.
Proportion of height hook to total height	1 : 2.3	1 : 3.4
Denticles 1st lateral	None	6–8

The further dissection showed numerous specific differences, especially in the details of the reproductive system, but the above summary will suffice alone to confirm their non-identity.

My grateful acknowledgements are due to Dr. Myrtle E. Johnson and Professor C. H. O'Donoghue for their kind cooperation, and especially to my wife for her unfailing skill and enthusiasm in the preparation of the figures, which illustrate this paper.

Explanation of Plates

Plate II

Fig. 1. *Acanthodoris hudsoni* MacF. Inner face first lateral teeth of 7th and 8th half rows of radula. In the 8th row the five outer laterals are also shown. x 128

Fig. 2. Individual elements of labial armature of *Ac. lutea* sp. nov., from side and behind. x 371

Fig. 3. Elements of labial armature of *Ac. rhodoceras* Cockerell and Eliot; *a*, from anterior margin in side view; *b*, from middle region from above; *c*, from posterior margin from above. x 371

Fig. 4. Inner face of first lateral teeth of 7th and 8th half rows of radula of *Ac. rhodoceras* Cockerell & Eliot. In the 7th row the six outer laterals are also seen. x 128

Fig. 5. Labial armature of *Ac. columbina* sp. nov., the two upper elements from above, the two lower ones from behind and in side view respectively. x 371

Fig. 6. Ventral median plate of labial armature of *Ac. lutea* sp. nov. x 83

Fig. 7. Inner face of first lateral teeth of 7th and 8th half rows of radula of *Ac. brunnea* MacF. In the eighth row the outer laterals are also seen. x 128

Fig. 8. Inner face of first lateral teeth of 7th and 8th half rows of radula of *Ac. lutea* sp. nov. In the eighth row the outer laterals are also seen. x 128

Fig. 9. Front view of first lateral teeth of 28th and 29th half rows of radula of *Ac. columbina* sp. nov. x 128

Fig. 10. Inner face of first lateral teeth of 7th and 8th half rows of radula of *Ac. columbina* sp. nov. In the eighth row the five outer laterals are also seen. x 128

Fig. 11. Ventral median plate of labial armature of *Ac. columbina* sp. nov. x 128

Plate III

Fig. 1. Anterior genital complex of *Acanthodoris columbina* sp. nov., as seen from above. The various parts are displaced only enough to show their relations. The glandular loops, *pr.* to *x*, of the vas deferens, *v. d.*, have been freed from their attachments to the upper, anterior face of the complex, and are rotated to the left and forward; the loops of the vaginal duct have been similarly displaced to the right from their normal position above the spermatotheca and its ducts. x 10

h. d., hermaphroditic duct; *h. a.*, hermaphroditic ampulla; *pr.*, prostatic portion of vas deferens, *v. d.*, extending to the point *x*; *p.*, the preputium; *ov.*, the short oviduct, entering the fertilization chamber in the gland mass below; *vag.*, the vagina, tapering into the vaginal duct, the last, crescentic loop, *vag. d.*, of which is thickened and glandular; *spth.*, the spermatotheca; *u. d.*, the uterine duct, connecting the spermatotheca with the fertilization chamber; *spc.*, the spermatocyst; *alb. g.*, the small albumen gland, surrounded by the nidamental gland, *n. g.*, the duct of which, leading to the exterior, is concealed by the preputium and vagina.

Fig. 2. Typical spicules from mantle of *Ac. columbina* sp. nov. x 26

Fig. 3. Typical spicules from mantle of *Ac. lutea* sp. nov. x 45

Fig. 4. Female channel of *Ac. rhodoceras* Cockerell & Eliot. *vag.*, the vagina; *v.*, the spherical, glandular vesicle; *vag. d.*, the vaginal duct; *spc.*, the spermatocyst; *spth.*, the spermatotheca; *u. d.*, the uterine duct, leading to the fertilization chamber. x 12

Fig. 5. Salivary gland of *Ac. columbina* sp. nov., *d.*, its duct. x 10

Fig. 6. Anterior genital complex of *Ac. lutea* sp. nov., as seen from above, the various parts being displaced as

little as possible. The attached loops of the vas deferens, *v. d.*, have been freed from their close union to the complex and spread apart toward the left, the loop *x* normally lying against the anterior face of the mass. The loop of the vaginal duct below *vag.*, is reflected backward from its normal position across the distal part of the preputium, *p.*, and its proximal thin loop at the left is normally directed straight backward, the thicker, glandular loop *gl* overlying and concealing the ducts of the spermatotheca and spermatocyst. x 8

h. d., hermaphroditic duct; *h. a.*, hermaphroditic ampulla; *pr.*, prostatic portion of vas deferens, extending to the point *x*, and closely bound down to the antero-dorsal surface of the complex by connective tissue; *v. d.*, the free, muscular loops of the vas deferens, extending below the oesophagus; *p.*, the preputium, the glans penis, *g.*, being represented as if seen through its muscular wall; *vag.*, the vagina, tapering insensibly into the vaginal duct, which dilates into a short glandular segment, *gl.*, before entering the spermatotheca, *spth.*; *spc.*, the spermatocyst; *u. d.*, the uterine duct, entering the fertilization chamber near the entrance of the oviduct, *ov.*; *n. g.*, nidamental-albumen gland complex, its broad duct leading to the exterior below the preputium and vagina.

NOTES AND NEWS

Mollusca of the Arequipa Valley, Peru.—The Arequipa Valley, outside of the irrigated areas, is excessively arid, and I was not able to find any native mollusca. I could not even find ants in the desert. In a damp place by the railway at Tingo, where the common dandelion was growing, I found *Agriolimax agrestis* and an immature brownish *Milax gagates*. Dr. E. Escomel gave me specimens of *Polita cellaria* which he

had found in Arequipa. They are unusually flat, approaching the variety *complanata* Jeffreys. Taylor, in his detailed account of the exotic distribution of these three species, fails to mention Peru, so they are probably now first recorded from that country. —T. D. A. Cockerell.

Reversed Snails and Reversed Human Beings.—Pseudoscience is not confined to the newspapers. Occasionally it appears in reputable scientific journals. Science News Supplement of *Science* for October 9, 1925, has the following amazing statement concerning snails:

"A given species will twist to the right or to the left, never both; for a 'left-shelled' snail to occur in a 'right-shelled' species is as unheard of as a man with his head on backwards."

Who has seen a man with his head on backwards? Probably every conchologist has seen and most of them have collected reversed snails and a considerable literature of the subject has grown up, including much on experimentation with reversed snails.—Junius Henderson, University of Colorado.

Ancilla muscæ, new name for *Ancillaria elongata* Gray, 1847 (Narrative of the Surveying Voyage of H. M. S. Fly, II, Appendix, p. 357); not *Ancillaria elongata* Deshayes, 1830 (Encyclopedie Méthodique II, p. 45). My attention having been called to the above duplication of names, a substitute is here proposed.—H. A. Pilsbry.

Etymology of Tornatellides.—The name of this Hawaiian genus of Tornatellinidæ was formed of the generic name *Tornatella* and the Greek ιδης, a patronymic suffix, the same word that is used in the plural to form family names in *-idæ*. It is not, as a friend has suggested, identical with the prior generic term *Tornatelloides*, for the latter is from *Tornatella* and ο-ειδος, meaning form or resemblance, likeness to.—Pilsbry.

Mr. R. B. Stewart, of the University of California, is studying the W. M. Gabb types of Californian Eocene mollusks in

the Academy of Natural Sciences of Philadelphia. An illustrated account of them is to be published.

Note on Ancylastrum.—I have not seen in the discussion of this name any reference to Bourguignat's idea of distinguishing the typical section of a genus subdivided into sections, by adding the suffix *astrum*. Thus in calling typical *Ancylus* (according to his view) *Ancylastrum* he did not intend to name a new genus but only to specify the typical section of those into which he divided the genus *Ancylus*. The suffix was applicable to the typical section of any subdivided genus.—W. H. Dall.

A Note on the Name Lophochiton.—In the Proceedings of the Academy of Natural Sciences of Philadelphia, vol. 77, 1925, p. 26, the writer proposed *Lophochiton* as a new subgenus of the peculiar group *Basiliochiton* to contain the aberrant *B. lobium* Berry, 1925.

Mr. Edwin Ashby has now very courteously called my attention to the fact that in the Transactions of the Royal Society of South Australia, vol 47, 1923, p. 233, he had already used the name *Lophochiton* for a quite unrelated Australian group. As this necessitates the renaming of my subgenus, the new name *Ploiochiton* derived from the boat-shaped outline of the shell, is here proposed to that end.—S. S. Berry.

Mr. Walter F. Webb informs us that he is now building up a private collection of shells that contains already some 15,000 species. Mr. Webb who has bought several large private collections including that of the late Mrs. Williams has thus been able to secure many rare species.

Professor Edward S. Morse.—As this issue goes to press we learn with sorrow of the death of Professor Morse on December 20.

PUBLICATIONS RECEIVED

Land and Freshwater Molluscs of the Dutch Leeward Islands (Occas. Papers Mus. Zool. Univ. of Michigan). By H. Burrington Baker. The collection discussed was made in the summer of 1922 in Curaçao, Aruba, Bonaire and Klein Bonaire. After an interesting discussion of the geologic, meteorologic and other environmental features, the location and special characteristics of each collecting station are described and illustrated in seven plates. In the treatment of species special attention is given to variation, local and in the individual colonies, the chief forms of each species being figured. The discussion of *Cerion uva* is especially full. In this species as well as many others there has been a remarkable amount of local differentiation for areas so small.

The salient characteristics of the fauna are thus summarized: "(1) There is a very high percentage of endemism [all but five of the 26 terrestrial species, with many subspecies being special to the islands]. (2) Sublittoral, limestone-loving species preponderate. (3) Typically South American groups are completely absent. (4) Several Antillean groups form conspicuous components of the total population. (2) Nevertheless, the closest affinities shown by any of the individual species are with forms from northern South America." "Two genera, *Stoastomops* and *Cistulops*, three subgenera, *Bonairea*, *Neosubulina s. s.* and *Cerion s. s.*, and a section, *Tudora s. s.*, are, as far as known, endemic to the Dutch Leeward Islands."

While the land operculates (Pomatiasidæ) and the cerions are the most conspicuous members of the land-snail fauna, the accounts of some smaller forms, such as the little-known *Neosubulina* and Microceramus of these islands, and the new genus *Stoastomops* are welcome, being accompanied by figures of both shells and teeth. Numerous new species and subspecies are described.—H. A. P.

The Marine Shells of the West Coast of North America. By Ida Shepard Oldroyd. (Stanford Univ. Publications, Geol. Sciences, Vol. I, 248 pp., 57 pls.). This volume covers the

Pelecypoda with a chapter on the Brachiopoda. The plan of the work is to give the original description of each species, its range and type locality, with the location of type specimens. While thus mainly a compilation, the collections of the author have been drawn on to extend some of the distributional data, and have supplied specimens of many species for figuring. Probably to save space, the bionomic relations of species are not considered, though the wide field experience of the author would no doubt supply abundant data. Nearly 500 species and subspecies are described and about 275 of them illustrated.

The genus *Marcia*, page 232, is evidently out of place and should be transferred back to page 155. The new species of coral figured on plate 49 might possibly cause some trouble in nomenclature, as the authority to be cited for the name is somewhat questionable.

West Coast conchologists will find this work indispensable. Its great merit is in making the descriptions of all the species accessible to the younger students, whilst heretofore a large library was requisite. It should be a great stimulus to West Coast conchology.—H. A. P. and C. W. J.

The Fresh-water Mussel Fauna of Eastern Oklohoma. By F. B. Isely (Univ. of Oklohoma Bull., U. Ser., No. 322, 1925, pp. 43–118). An exhaustive study of the distribution and ecology of the Unionidæ of this region.

Shell-mounds and changes in the shells composing them. By Edward S. Morse. The Scientific Monthly, October, 1925. Important evidence for evolution is afforded by these comparisons of living shells with those found in the aboriginal refuse heaps, both in New England and Japan. "The changes in the shape of the shells are an important illustration of the fact that when you have a unit of time sufficiently long, species change."

Recent Mollusca, a Catalogue of the Land Shells. By Hugh C. Fulton, Oct., 1925, 63 pp. An up-to-date catalogue, according to the latest authorities and useful in arranging collections.

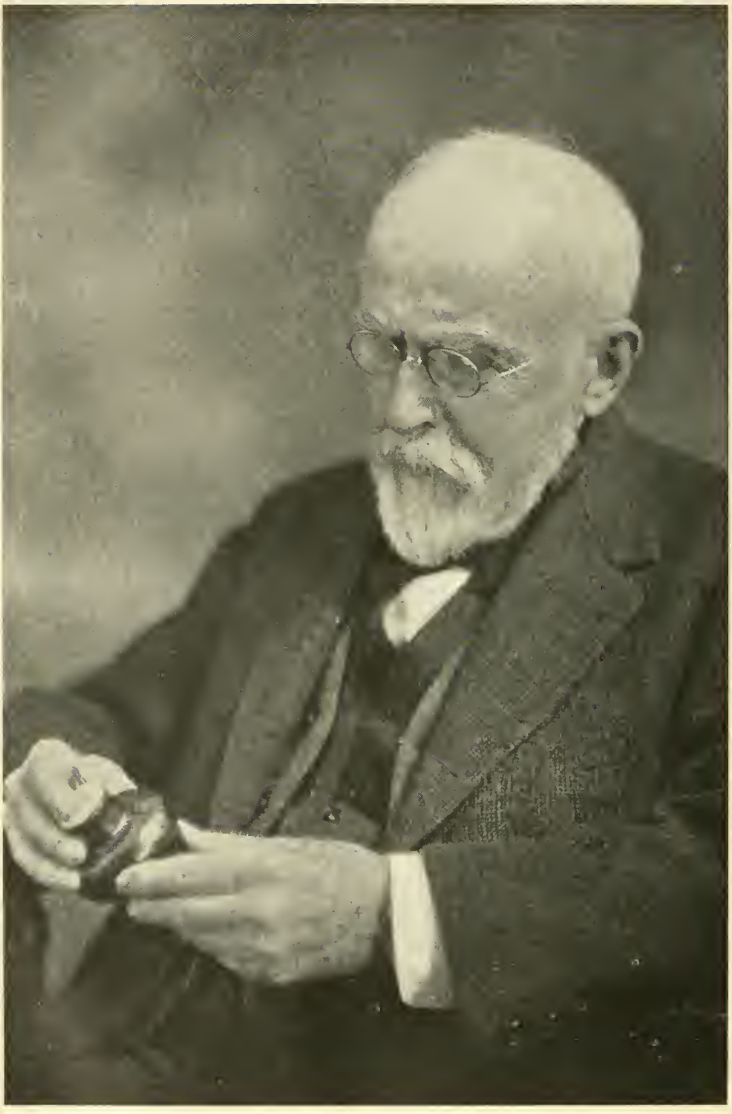
THE ARTHROPOD PARASITES OF MOLLUSKS, with description of a new dipterous parasite from Brazil. By J. Bequaeart (Journal of Parasitology, June, 1925). The various forms which have been found parasitic on mollusks are reviewed, and a new fly which apparently in the larval stage feeds upon *Bulimulus tenuissimus* and then pupates in the shell is described. Collectors of land shells should be on the watch for their external parasites, as very little seems to be known of the forms of this country.

GROWTH AND AGE AND MATURITY OF THE PACIFIC RAZOR CLAM, SILIQUA PATULA (Dixon). By F. W. Weymouth, H. C. McMillin and H. B. Holmes. (Bull. Bureau of Fish, Vol. 41, pp. 201–236, Doc. 984, 1925). An important biological paper on this interesting bivalve. To most conchologists it is a surprise to learn the economic importance of this mollusk. The cannery at Cordova, Alaska, was started in 1916. In 1917 and 1918 the output was approximately 50,000 cases; in 1924 it was about 43,000 cases.

A NEW SPECIES OF MICROMYA. By Bryant Walker (Occas. Papers Mus. Zool., Univ. Mich., no. 163, pp. 1–6, pl. 1, 1925). The type locality for the species (*M. ortmanni*) is Green River, Mammoth Cave, Ky.

DESCRIPTION OF A NEW SPECIES OF PHYSA FROM THE PLEISTOCENE OF FLORIDA. By Wm. J. Clench (Occas. Papers Mus. Zool., Univ. Mich., no. 164, pp. 1–4, pl. 1, 1925). The species *P. barberi* is from the canal embankment, West Palm Beach, Fla.

ILLUSTRATIONS OF UNFIGURED TYPES OF SHELLS IN THE COLLECTION OF THE UNITED STATES NATIONAL MUSEUM. By Wm. H. Dall (Proc. U. S. Nat. Mus., Vol. 66, art. 17, pp. 1–41, pls. 1–36, 1925). Some 200 species are beautifully illustrated and seventeen new species described.



EDWARD S. MORSE

THE NAUTILUS.

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PLIOCENE VIVIPARUS-LIKE OPERCULA FROM CALIFORNIA[1]

BY WENDELL P. WOODRING

In 1924 Hanna and Gaylord[2] described as *Scalez petrolia* gastropod opercula that are confined to a thin layer in nonmarine beds lying between marine beds in the Etchegoin formation, of Pliocene age, penetrated by wells in the Elk Hills oil field and the adjoining Sunset-Midway field, at the south end of the San Joaquin Valley of California. These fossils, which are used to great advantage as guide fossils by the oil operators, will be described and figured in a report on the Elk Hills field now in preparation by the United States Geological Survey, but it seems desirable to put on record certain conclusions with regard to their generic relations. At the time when they were described no shells that were large enough for opercula of this size had been found, and Hanna and Gaylord suggested that they represent a chitinous-shelled or shell-less gastropod, probably of the family Amnicolidae, subfamily Bithyninae.

These opercula have a "length," measured along the longest diameter, of 6.2 to 8.7 millimeters and a "width" of 4.5 to 7

[1] Published with the permission of the Director of the United States Geological Survey.

[2] Hanna, G. D., and Gaylord, E. G., Description of a new genus and species of freshwater mollusks (*Scalez petrolia*) from the Etchegoin Pliocene of California: California Acad. Sci. Proc., ser. 4, vol. 13, pp. 147–149, 2 figs., 1924.

millimeters. They are composed of very thin calcareous laminae that are very fragile and peel off. The exterior surface is concave and the interior surface is convex. The nucleus lies close to the columellar side and concentric lines encircle it. On the interior surface a narrow thickened ridge lies between the columellar edge and the area where the foot was attached.

Fresh-water fossils, consisting principally of *Amnicola* and fresh-water ostracods, are the only fossils in the beds carrying the thin layer containing *Scalez petrolia*. Therefore it can be assumed that these opercula represent gastropods that lived in streams or lakes. It is apparent that the fossils are very similar to *Viviparus* opercula, despite the fact that all living species of *Viviparus* have horny opercula. The nucleus of the fossils lies closer to the columellar edge and the fossils are a little less than half as large as opercula of adult specimens of *Viviparus* living in eastern United States. No native species of *Viviparus* are now living west of the Rocky Mountains. An Eocene species has been described from Washington and a Miocene species from Nevada, but apparently the genus has not been discovered in late Tertiary deposits on the Pacific coast. Several species have been described from the late Cretaceous and early Tertiary deposits of the Rocky Mountain region. The opercula of these fossil species are not known. *Scalez petrolia* also resembles opercula of the genus *Ampullaria*, especially of the exotic species that have calcareous opercula, but the fossils are much smaller, thinner, and less elongate and fail to show the deep groove along the outer edge of the area where the foot was attached. The geographic distribution of *Ampullaria* also affords evidence that *Scalez* is not an *Ampullaria*-like mollusk, as it is not probable that a characteristically tropical genus lived in central California during Pliocene time.

After these fossils were described Doctor Hanna discovered a few broken shells that seem to represent the shell of the animal, and I am indebted to him for a core containing several broken, crushed shells. They are very thin and imperforate, and are marked by fine, but conspicuous, growth lines. At the aperture the body whorl has a height of 8.5 to 11 millimeters, but all the shells are flattened and the height is a little exaggerated.

So far as these crushed pieces go, they are very much like shells of a relatively small *Viviparus.*

The opercula and the less satisfactory crushed shells indicate that these fossils, to which the rather unfortunate generic name *Scalez* was given, represent an extinct group of Viviparidae that had calcareous opercula, although all living representatives of the family have horny opercula, and no other fossil Viviparidae having calcareous opercula have been found. Other families, such as the Naticidae, Ampullariidae and Amnicolidae, embrace genera with horny opercula and also genera with calcareous opercula.

So far these opercula have been found only in cores of cuttings, but it is safe to predict that they will eventually be found at the outcrop of nonmarine beds of Etchegoin age. Their remarkably limited stratigraphic range, on which their value to the oil operator depends, is more probably due to the absence of other nonmarine beds in the upper part of the Etchegoin formation in the Sunset-Midway and Elk Hills fields than to their actual sudden appearance and disappearance. It would not be surprising to find them in other wedges of nonmarine Etchegoin deposits.

NOTES ON THE NAIADES OF THE UPPER MISSISSIPPI DRAINAGE:

III. On the Relation of Temperature to the Rhythmical Contractions of the "Mantle Flaps" in Lampsilis ventricosa (Barnes)

BY N. M. GRIER

Ortmann (Mem. Carnegie Museum 4: 319, 1911) first described the rhythmical wave-like contractions of the lamellae and flaps of the mantle in the gravid female of *Lampsilis ventricosa.* His account includes a description of the position of the shell during the process. The animal orientates itself so that its anterior end is against the current, while the shell is so tilted that the animal almost "stands upon its head". The "mantle flaps", which are ribbon-like prolongations of the lamellar portions of the mantle, are slowly protruded as the creature opens

its shell, and floating freely, commence to contract as described. Coker, Shira, Clark and Howard (Bull. Bur. Fisheries 37: 77–181, 1921) point out the resemblance of these mantle flaps to small fish, and their motion in the current further enhances this resemblance. Since the enlarged marsupia are situated nearby, they suggest that a fish darting at this tempting bait may cause the extrusion of the glochidia and possibly the infection of a host fish. Following the removal of an aquarium specimen from the water, the mantle flaps were immediately drawn into the shell, but when replaced on its side in an aquarium whose bottom was soft mud, I have observed that the animal turned over on its umbones and resumed the rhythmical contractions within half an hour. At first the rate is quite slow as if the creature were "warming up" but rapid acceleration occurs to a maximum rate which seems to be influenced by the temperature. Apparently the animal may continue these contractions for hours at a time, if not disturbed in any way.

As noted by Ortmann (loc. cit.), other members of this genus possess these mantle flaps, but of these species, the contractions of the mantle flaps seem to have been studied only in *Lampsilis siliquoidea* (Barnes) by Howard and Anson (Journ. Parasitology 9: 70, 1922–23). These observers believe with Coker, Shira, Clark and Howard that these undulations are an aid to respiration as well as an attraction to predatory fish. They suggest that this rhythmic action may be related to the fact that these two species are inhabitants of lakes or lacustrine portions of streams where dissemination of the glochidia by current action would be slight. They also believe that the predaceous fish which are the hosts of these mussels may be attracted by the undulations of the mantle flaps.

In this case, the behavior of *L. siliquoidea* was observed in running water at a temperature of 73° F. (22.8 C.) in a cement aquarium. They noted "regular undulations of two rapidly succeeding waves lasting two seconds, each taking approximately a second to pass from the outer ventral lobes to the eyespots." This would indicate a contraction rate of from 16–20 waves per minute, since the intervals between the undulations averaged 4–5 seconds. The marsupium withdrew following

disturbance of the water and invariably before the mantle lobes made any response. Ortmann merely states for *L. ventricosa* that the contractions follow one another in quick succession—perhaps 2–3 in a second, remarking that a lively current of water must be produced over the protruded marsupia.

My own observations have principally to do with the effect of temperature on the rate of these rhythmical contractions in *L. ventricosa* as shown in the following table. The specimen observed was kept in an cement aquarium and there was little if any disturbance of the water.

Temperature	Average Number of Contractions per Minute
14.5° C.	63
19° C.	108
20.5° C.	112
21° C.	121
22.5° C.	128

In the first observation, a slight disturbance of the water reduced the number of contractions to 52 per minute. It was noted also that the marsupia did not fully protrude until a contraction rate of 121 per minute was reached, an observation which checks that of Ortmann. No resting interval was noted between the contractions as was pointed out for *L. siliquoidea.*

If we accept as most probable the suggestion of the observers cited that this device serves to attract the predatory fish which distribute the glochidia, we may conclude that a temperature which lowers or raises the rate of contractions also tends to increase or diminish the reaction time of these fish which are also of the same temperature as the environment. Thus the two kinds of animals may be kept in the relationship indicated. On the other hand the device, while easily conceivable as serving such a purpose, undoubtedly also contributes to the more complete aeration of the crowded marsupia, the demands of the glochidia for oxygen rising with the temperature, hence the greater rate of contraction. At any rate the apparatus described is worthy of a fuller study from the histological and physiolog-

ical standpoint. I am indebted to Messrs. Joseph Berwick and Irving Fountain for aid in making these observations.

Dartmouth College, Hanover, N. H.

THE LAST WORD ON ANCYLASTRUM

BY TOM IREDALE[1]

Burrington Baker's conclusion (Nautilus, Vol. XXXIX, 1925, 47) that "*Ancylastrum* does apply to the Tasmanian group" may be refuted by extracts from the literature without entry into disputatious matters as to whether the previous exponent erred or otherwise.

Bourguignat published in the Journ. de Conch., Vol. IV., 1853, a paper entitled "Notice sur le genre *Ancylus*." This paper appeared in the part dated Feb. 15, 1853, beginning on p. 55. At p. 60 he gave a "Description du genre" in which the diagnosis stated "présentant un sommet mousse, obtus, ou aigu, plus ou moins incliné à droite (*ancylastrum*) ou à gauche (*velletia*)."

Thus the two sections, *Ancylastrum* and *Velletia* comprise one genus *Ancylus*.

Then followed a "Division du genre Ancyle" and first Beck's division into *Ancylus* and *Acroloxus* is quoted. The composition of the second part is demurred to and as there was no definition the name was rejected.

Gray's division into two genera is then considered and "*Velletia*, dont le type seraît l' *Ancylus lacustris* de Müller," is remarked upon thus: "Cette division est bonne . . . mais nous ne pensons pas que ce caractère isolé soit suffisant pour autoriser la création d'un genre, et nous ne conserverons l' appellation *Velletia* qu' à titre de simple division du genre *Ancylus*."

The other division was *Ancylus* of Gray and Beck with *A. fluviatilis* as type.

Then the whole matter is simply explained thus: "Quant à nous, nous adoptons la division du genre en deux coupes.

[1] By permission of the Trustees of the Australian Museum.

1re section. S. G. *Ancylastrum.*

2e section. S. G. *Velletia.*

Nous employons le mot *Ancylastrum*, d' accord en cela avec M. Moquin-Tandon, pour désigner notre premier groupe, parce qu'il ne nous a pas paru logique de conserver le nom même du genre pour en désigner seulement une division: d'un autre côté, la nature typique qu'il faut reconnaître aux espèces que nous prétendons classer dans cette section, exigeait que le nom du groupe rappelât en quelque sorte l'appellation générique. Nous avons donc agi comme le font souvent les botanistes en pareil cas, et nous avons usé du secours de leur terminologie, en employant la désinence *astrum*, dont ils se servent lorsqu'ils établissent dans un genre une subdivision dont la dénomination doit indiquer l'origine.

Quant à notre seconde section, nous adoptons pour elle le nom proposé en 1840 par M. Gray.

It may be as well to recapitulate the above in plain English so that no further misunderstanding can arise. Bourguignat never proposed a genus *Ancylastrum:* he introduced the name for the typical section of *Ancylus* as understood by him, and typified by *Ancylus fluviatilis* merely to avoid using the generic name *Ancylus* for a subgenus.

It may be added that Fischer in the Manuel de Conch., p. 504, 1883, has displayed the facts as I have above written, thus:

Genus *Ancylus* Geoffroy, 1767. Example *A. fluviatilis* Müller.

S. g. *Ancylastrum* Moquin-Tandon, 1853. Ex. *A. fluviatilis* Müll.

S. g. *Velletia* Gray. Ex. *A. lacustris* Müll.

Consequently Ancylastrum can NOT be used for the Tasmanian *A. cumingianus* Bourguignat, and for this group I here provide the new generic name *Tasmancylus*, naming that species as type, and will more fully discuss the details in an account I am now preparing.

ON MYCETOPODA FALCATA HIGGINS

BY H. VON IHERING

Mr. William B. Marshall has been led by his study on the microscopic sculpture of the pearly fresh-water shells (Proceedings U. S. National Museum, vol. 67, art. 15, pl. 10, 1925) to the conclusion that the *Mycetopoda falcata* which Simpson erroneously has considered a *Solenaia*, must belong to *Mycetopoda*, or an allied genus. This has been my opinion also for some time, for the reason given below.

Mendranath published a paper on the anatomy of certain Indian Unionidae (Rec. Indian Museum XIV, pp. 109–122, plate 16, 1918) in which according to the Archiv f. Molluskenkunde, p. 48, 1922, he says that *Solenaia soleniformis* Benson, is allied to *Physunio*, and belongs to the *Tetragenæ*. *Solenaia* therefore has nothing to do with the family *Mutelidæ*.

The first exact data on the habitat of *Mycetopoda falcata* we owe to Dr. Fritz Haas of the Senckenburg Museum in his publication "Trabajos del Mus. Nacional de Ciencias Naturales, Madrid Zool. Series, No. 25, p. 57, f. 2, 1916. He there describes *Mycetopoda bolivari*, n. sp., which is evidently identical with *Mycetopoda falcata* Higgins. The specimen of *M. falcata* described by Haas as *M. bolivari* comes from the Rio Unuyacu, an affluent of the Rio Napo, in Ecuador.

NEW FORMS OF PLANORBIS AND LYMNAEA WITH NOTES ON OTHER FORMS

BY FRANK COLLINS BAKER[1]

PLANORBIS TRIVOLVIS WINSLOWI n. var.

Shell ultra-sinistrial, discoidal, carinate above and below; color brownish or greenish horn; surface dull, sculpture coarse, the lines of growth forming distinct, wide-spaced riblets; no

[1] Contribution from the Museum of Natural History, University of Illinois, No. 36.

spiral sculpture; whorls about 4, high, closely wound, the body whorl flatly rounded; spire with the first 2½ whorls flat, the body whorl being concave and raised above these whorls; superior angulation very distinct and often sharp; umbilicus round and deep, very small, exhibiting 2½ whorls, the base of the body whorl sharply angulated and roundly sloping into the umbilical region; the vertical striation cuts sharply across the angulated base; aperture ovate, narrowed above where it forms an acute angle raised above the body whorl; broadly rounded below and extending below the body whorl; outer lip sharp, with internal brown-edged callus, reflected and slightly flaring in some fully adult specimens; inner lip forming a thin, spreading, white callus over the parietal wall.

Length, 13.5; diameter, 22.5; aperture length, 12.2; diameter, 8.0 mm. Holotype.

Length, 12.1; diameter, 21.2; aperture length, 12.2; diameter, 7.6 mm. Paratype.

Type locality: Little Arbor Vitae Lake, Vilas Co., Wisconsin.

Types in Mus. Univ. Mich.; paratypes Mus. Univ. Ill., 718637.

Remarks: *Winslowi* is apparently a very distinct variety of *trivolvis*. It resembles *pilsbryi* in some respects, but is smaller, only about half the size of adult individuals of that variety, and the body whorl is sharply angulated and more flat-sided. It was at first thought to represent a distinct species, but the presence of individuals varying toward *trivolvis* in the type lot, as well as in nearby waters, indicate a relationship to this large planorbid. Specimens from Big Arbor Vitae Lake and from the Manitowish River are of this intermediate character. It was collected by the Michigan fish collectors Messrs. Metzelaar and Langlois. It is named in honor of Miss Mina L. Winslow, the able curator of Mollusca of the University of Michigan Museum, who first brought the novelty to the attention of the writer.

PLANORBIS TRIVOLIS PILSBRYI n. var.

Planorbis binneyi Baker, NAUTILUS, XXIII, p. 41, 1909; Trans. Wis. Acad. Sci. Arts., XVII, p. 237, 1911; Tech. Pub.

N. Y. State Coll. For., 4, p. 277, fig. 46, nos. 17, 18, 1916; Op. Cit., 9, p. 175, 1918.

Shell ultrasinistral, very high as compared with its diameter; whorls $4\frac{1}{2}$, rather tightly coiled, the body whorl with a rather distinct carina above; spire flat and depressed below the level of the body whorl; umbilical region deep, three full turns of the shell visible, the umbilicus small and deep; sutures varying from barely marked to deeply impressed, forming a v-shaped trough; sculpture more regular than in typical *trivolvis*, the riblets more widely spaced; aperture very high, forming a sharp triangle above, widely expanded below, somewhat flaring, but not turned over as in typical *trivolvis*.

Length, 15.0; diameter, 27.5; aperture length, 14.5; diameter, 9.0 mm. Holotype.

Length, 16.0; diameter, 26.0; aperture length, 15.5; diameter, 9.5 mm. Paratype.

Length, 14.0; diameter, 26.0; aperture length, 13.0; diameter, 8.0 mm. Paratype.

Type locality: Tomahawk Lake, Oneida Co., Wisconsin. Types in coll. Baker, 846; paratypes in A. N. S. Phila. 140269.

Remarks: Mature *pilsbyri* differs from *trivolvis* in having higher whorls as compared with their diameter, a deeper and more funnel-shaped umbilicus, a longer and narrower aperture which is more angular above, the upper side of the body whorl (spire) is more sharply carinated, the spire whorls flatter and more regularly and deeply immersed in the coil of the body whorl, and the lines of growth are evenly spaced and heavier, often forming incipient costae. There is some variation in form, this being toward the *trivolvis* form, a variation especially noted in specimens from Moose Ear Creek, Barron Co., Wis. The types from Tomahawk Lake are very distinct and without the intermediate forms of other places would be considered a good species.

The writer previously considered this large corpulent Planorbis as referable to Tryon's *binneyi*. A critical comparison of specimens of *binneyi* from Oregon, the type state, with the large Wisconsin Planorbis shows that this approximation is not correct and that the true *binneyi* is a different species, having a

heavier shell, more heavily carinated body whorl, and especially quite different sculpture, which is coarser than in *pilsbryi*. *Binneyi* occupies a totally different drainage system and probably is related rather to *Planorbis ammon* than to *trivolvis*. *Pilsbryi* is distributed well over the northern part of the United States (and probably southern Canada) from Wisconsin to New York. It seems eminently fitting that this finest Planorbis in the northern states should be dedicated to Dr. Henry A. Pilsbry.

STAGNICOLA WALKERIANA n. sp.

Shell ovately globose, inflated, rather thin; periostracum pale horn, darker in many specimens, sometimes tinged with purple; surface dull to shining, lines of growth coarse and close-set, spiral striation well marked: apex wine-colored; whorls 5, rapidly increasing in diameter, inflated, tumid, body whorl rather bulbous; spire short, broadly conic, rather wide; nuclear whorls $1\frac{1}{2}$ in number, flattened, especially the first whorl which is very flat, sunken in the volution of the second whorl in the adult shell, and separated by a deep sutural channel; sutures impressed; aperture ovate or elliptical, sometimes rounded, occupying more than half the length of the shell, with brownish interior; outer lip convex, thin or thickened by a slight brown-edged varix; inner lip flattened, reflected over the parietal wall to form a rather thin callus and raised above the umbilicus forming a broad, flat projection partly hiding the otherwise distinct umbilical chink; axis not much twisted, but the columella is slightly thickened and in many specimens the inner lip is appressed so as to form a rather well-marked plait, the umbilical chink varies greatly in size, the surface of the shell is often malleated.

Length, 17.0; diameter, 11.0; aperture length, 10.5; diameter, 6.2 mm. Holotype.

Length, 16.5; diameter, 11.0; aperture length, 11.1; diameter, 6.0 mm. Paratype.

Length, 16.2; diameter, 10.0; aperture length, 10.0; diameter, 6.7 mm. Paratype.

Type locality: Madeline Island, near Bayfield, Bayfield Co., Wisconsin. Types in Mus. Univ. Wis.. No. 4695; paratypes, Mus. Univ. Ill., No. 19437, Phil. Acad. Sci. No. 140268.

Remarks: *Walkeriana* resembles both *catascopium* and *emarginata angulata*. It is comparatively wider than *catascopium*, is (usually) umbilicated, has a shorter, broader spire and more tumid whorls. The columella is quite different, being broader, erect, and lacking the plait and twist of that species. It may be known from *angulata* by its more regularly ovate shell, more pointed spire, more ovate and less rounded aperture, and less rotund body whorl. *Angulata* is also larger and heavier than *walkeriana*. It more closely resembles *emarginata ontariensis*, which, however, has a thicker shell of a different color and texture, a longer, more pointed spire with flat-sided whorls, a more compressed body whorl, and a differently shaped inner lip.

A restudy of *binneyi*, *apicina*, and *solida* leads the writer to change completely the opinion given in the Monograph of the Lymnaeidæ concerning these species. *Binneyi* is a river species, its type locality being the Hell Gate River, Montana, which is a tributary of the Columbia River, hence the Pacific drainage. All authors have confused several species with the true *binneyi*, which should be restricted to river forms conforming to the diagnosis and figure of Tryon in the Journ. of Conch., p. 229, pl. 23, fig. 3. This is different from the lake shells under consideration, which all have a short spire and a differently shaped aperture. The two type specimens of *binneyi* in the Philadelphia Academy (No. 58506) are like Tryon's description and are different from the shell of the Great Lakes.

The reference of certain Michigan lake shells to *apicina* by the writer in the Lymnaea monograph is also erroneous. They have only a superficial resemblance to the types of the western form and it is now believed that *solida* and *apicina* as a synonym, should be restricted to the region west of the Rocky Mountains, the Pacific drainage. This is a river species and obviously would be different from a typical Great Lake species.

The lake forms previously referred to *binneyi* and *apicina*, for both forms referred to these species are variants of the same thing, should apparently be separated from all other species of the lake region and they are accordingly recognized under the name of one of America's distinguished students of the Mol-

lusca, Dr. Bryant Walker. The reference of these lake shells to another species removes an apparent anomaly in the distribution of the west coast forms to which they have been referred and brings them more in accord with our present knowledge concerning the ecological distribution of species in lakes and rivers.

MOLLUSCS FROM THE MANITOBA—ONTARIO BOUNDARY

BY ALAN MOZLEY
University of Manitoba

The species noted below were collected during the years 1923–25 in the vicinity of the boundary between the southern portions of the provinces of Manitoba and Ontario, Canada. This district is near the western border of the Canadian Zone in southern Manitoba, and outcrops of Pre-Cambrian rocks form the most striking geological feature. The area is treed principally by conifers. Due to irregularities of relief thousands of small lakes have formed. As has been pointed out by Bensley (2) many of the lakes of this Archean area have a high content of organic detritus, and often have their waters discolored by vegetable extracts till they resemble weak tea. The area in which the collecting was done lies wholly within the Hudson Bay drainage system. The Winnipeg River with its connecting waters, including the English River, the Lake of the Woods, and Shoal Lake, forms, when its fauna is considered, a distinct section of the Nelson River portion of this northern drainage. Very few molluscs have been collected in this district, the only previous records being those of Binney (3 & 4), Dall (5), Hanham (6) and Mozley (8). The records of Adamstone (1), Robertson (10), and Whiteaves (12–15) while from closely similar habitats do not relate to the same drainage system. This list includes thirty-three species of which only four have been previously recorded from this area. In addition there are three species the precise identity of which has not been ascertained, but which are distinct from the others mentioned. A collection

was made in a backwater of the Winnipeg River a short distance west of Minaki station, this is referred to simply as Minaki, Winnipeg River. The list of references is believed to contain all the papers pertaining to this district which have appeared since Dall's volume was published. Drs. Victor Sterki, Bryant Walker, and F. C. Baker very kindly identified many of the species and confirmed certain others. I am also indebted to Dr. C. H. O'Donoghue, and Messrs. L. B. Clark and A. B. Gresham for collecting certain shells.

Pelecypoda.

Family Unionidae.

Lasmigona complanata Barnes.

Ontario: Minaki, Winnipeg River. Rare. The shells collected were small, dark-colored, and much eroded. Typical measurements are: Length, 81 mm.; height, 60 mm.; depth, 24.5 mm.; thickness, 1 mm. (maximum at periphery and center). It is of interest to note the extreme thinness of the shell in this Pre-Cambrian country where there is little available lime. Ortmann (9, p. 136) states that this species occurs in the "Lake of the Woods, belonging to the upper lakes drainage." The Lake of the Woods is in the Hudson Bay drainage.

Anodonta grandis footiana Lea.

Ont.: Minaki, Winnipeg River; Otter Lake, near Cygnet Rapids a few miles east of Malachi.

Strophitus edentulus Say.

Manitoba: Whitemouth River, near its junction with the Winnipeg River.

Lampsilis superiorensis Marsh.[1]

Ont.: Minaki, Winnipeg River; Pistol Lake, near Minaki; Fox Lake, near Wade. This species is abundant at Minaki.

[1] Dall (5, p. 125) records this species from "Hill River, Keewatin." I have been unable to locate this river, although there is a Hill or Hilly Lake with a river flowing from it, south-west of Jackpine, Ont. (C. P. R. main line), which was in the old District of Keewatin.

Typical measurements from this habitat are: Length, 68 mm.; height, 42 mm.; depth, 27 mm.; thickness (at center), 1.1 mm. Length, 72 mm.; height, 41 mm.; depth, 29.5 mm.; thickness (at center), 1.5 mm. Length, 68 mm.; height, 41 mm.; depth, 26.5 mm.; thickness (at center), 1 mm.

Family SPHAERIIDAE.

Sphaerium sulcatum Lam.

MAN.: Indian Bay Station (Waugh), Falcon Bay (Shoal Lake).

ONT.: Rainy Lake, one mile east of Wade. This lake should not be confused with the Rainy Lake on the International Boundary.

Sphaerium crassum Sterki.

MAN.: Indian Bay Station, Falcon Bay.

ONT.: Minaki, Winnipeg River. Some of the specimens from Falcon Bay had the hinges reversed. This species has not been previously reported from Manitoba. Adamstone (1.) found it in Lake Nipigon, Ont., in the Great Lakes drainage.

Sphaerium solidulum Prime.

MAN.: Whitemouth River, near its junction with the Winnipeg River.

Sphaerium striatinum Lam.

MAN.: Whitemouth River, near its junction with the Winnipeg River. Sterki (11, p. 435) apparently thinks the previous Manitoba records for this species are not sufficiently authenticated to consider.

Sphaerium occidentale Prime.

MAN.: Mile 69, G. W. W. D. Ry., near the settlement known as Birch River. Shallow railway ditch.

Sphaerium truncatum Lindsay.

ONT.: Skunk Lake, one mile west of Minaki. This species has not been previously reported from this part of the country.

Musculium securis Prime.

Ont.: Alice Lake, between Minaki and Wade.

Pisidium tenuissimum Sterki.

Ont.: Skunk Lake, near Minaki. This species has not been previously reported from the Hudson Bay drainage.

Gastropoda.

Family Pupillidae.

Acanthinula harpa Say.

Ont. Poplar-Birch-Jack Pine habitat, 1½ miles east of Malachi; Otter Lake, near Cygnet Rapids, between Malachi and Wade, pure stand of young birch.

Strobilops affinis Pils.

Ont.: 1½ miles east of Malachi, as above; near Cygnet Rapids, as above.

Family Zonitidae.

Euconulus chersinus polygyratus Pils.

Ont.: 1½ miles east of Malachi, as above. This species has not been previously recorded from Western Canada.

Zonitoides exigua Stimpson.

Ont.: 1½ miles east of Malachi, as above; near Cygnet Rapids, as above. This species has not been previously reported from Western Canada.

Zonitoides arborea Say.

Ont.: 1½ miles east of Malachi, as above.

Polita hammonis Strom.

Ont.: 1½ miles east of Malachi, as above; near Cygnet Rapids, as above.

Family Endodontidae.

Pyramidula cronkhitei anthonyi Pils.

Ont.: 1½ miles east of Malachi, as above.

Family Succineidae.

Succinea ovalis Say.

Man.: Mile 76½, G. W. W. D. Ry., near the settlement known as East Braintree.

Ont.: Near Cygnet Rapids, as above.

Succinea sp.

Ont.: Near Cygnet Rapids, as above.

Family Lymnaeidae.

Lymnaea stagnalis appressa Say.

Ont.: Minaki, Winnipeg River.

Lymnaea stagnalis sanctæmariæ Walker.

Man.: Lake Brereton. This variety has not been previously reported from the Hudson Bay drainage.

Lymnaea emarginata canadensis Sow.

Ont.: Minaki, Winnipeg River,

Lymnaea emarginata angulata Sow.

Man.: Winnipeg River, near its junction with the Whitemouth River. This variety is new to Manitoba.

Lymnaea vahlii Moll.?

Man.: Mile 69, G. W. W. D. Ry., shallow railway ditch.

Lymnaea obrussa exigua Lea.

Man.: Mile 69, G. W. W. D. Ry., as above.

Lymnaea apicina Lea?

Ont.: English River, not far from its junction with the Winnipeg River; Lost Lake, near Minaki.

Lymnaea megasoma Say.

Man.: Indian Bay Station, Falcon Bay.

Family Planorbidae.

Planorbis corpulentus Say.

Ont.: Minaki, Winnipeg River; Sand Lake (Winnipeg River); White Dog, Winnipeg River; Sword Lake, near Minaki; Fox Lake, near Wade. Binney (4, p. 114) states that this species is found in the "Winnipeck River," possibly meaning the Winnipeg River.

Planorbis trivolvis Say.

Man.: Indian Bay Station, Falcon Bay.

Planorbis campanulatus var.

Man.: Indian Bay Station, Falcon Bay.

Ont.: Minaka, Winnipeg River; White Dog, Winnipeg River; Star Lake, near Reddit; Alice and Onion Lakes, near Minaki; English River, near its junction with the Winnipeg River. These shells belong to a new variety, shortly to be described by Miss M. L. Winslow of the Museum of Zoology University of Michigan.

Planorbis exacuous Say.

Ont.: Minaki, Winnipeg River. The single shell upon which this record is based does not appear to belong to the variety *megas* Dall.

Planorbis parvus Say.

Ont.: Minaki, Winnipeg River; Alice and Lost Lakes, near Minaki; Malachi Lake, Malachi.

Family Physidae.

Physa integra Hald.

Man.: Mile 77, G. W. W. D. Ry., just below a small rapids on the Birch River.

Ont.: Lost and Sword Lakes, near Minaki; Star Lake, near Reddit.

Physa gyrina Say.

Ont.: Minaki, Winnipeg River; Sand and Onion Lakes, near

Minaki; English River, forty miles north of Minaki; Fox Lake, near Wade; Otter Lake, near Malachi.

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A LIST OF THE MOLLUSKS COLLECTED BY MR. OWEN BRYANT ALONG THE COASTS OF LABRADOR, NEWFOUNDLAND AND NOVA SCOTIA

BY CHARLES W. JOHNSON

In the summer of 1908 the schooner *Lorna Doone* belonging to Dr. Wilfred T. Grenfell was chartered by a party including Mr. Owen Bryant and his brothers Dr. John Bryant and Mr. Edward S. Bryant. The vessel went as far north as the southern end of Cape Chidley Island. The most northern points at which Mr. Bryant collected were Mettek Island near Eclipse Harbor and Kowaktorvik Bay, north of Nachvak. In regard to collecting Mr. Bryant says: "I started out with the idea of collecting on land and had no intention of doing any dredging. On the way to St. John's the vessel happened to be drifting over part of the Grand Banks in about 50 fathoms of water, I collected a number of pelagic animals by using a butterfly net as a tow net. This gave me the idea of making use of any future opportunities by dredging. At St. Johns I had a blacksmith make me a dredge frame, had some netting sewed together to form a bag and bought 200 fathoms of rope, about one-half inch in diameter. The dredge often came in very hard, but we

had lots of man power on board; occasionally there were as many as fourteen men pulling on the rope, and by swaying we could get in only about four inches at a time, so you see we had plenty of exercise. Sometimes the vessel was being carried south by the Labrador current although we were sailing north in a very light breeze, and we had to pull the vessel ahead in order to get to the dredge. The dredge was practically always filled, and all the sand was washed through a sieve and every specimen I could see was saved from each haul."

I have added to this list the species collected by Mr. Bryant in Newfoundland in 1905 and 1906, part of this time being spent with Dr. Grenfell at St. Anthony. The following list of localities and stations where collecting was done, was given in full, as they are somewhat abbreviated in the list of species. Mr. Bryant presented the collection to the Boston Society of Natural History.

The bibliography bearing on the fauna of this region is quite extensive and that pertaining to the Mollusca is given by J. F. Whiteaves: *Catalogue of the Marine Invertebrata of Eastern Canada*, in Geol. Survey of Canada, 1901. Packard's *The Labrador Coast*, 1891, also contains an extensive bibliography and a list of the mollusks. *Labrador, The Country and the People*, by Wilfred T. Grenfell and others, contains a short article bearing on the mollusks collected by Mr. Bryant, which are here treated in detail.

List of localities: LABRADOR

Mettek Island, near Eclipse Harbor, Sept. 5.

Kowaktorvik Bay, north of Nachvak, 5 fathoms, rocky, Aug. 28.

Outside of Hebron, 60 fathoms, gravel, Aug. 25.

Off Hebron, 60 fathoms, mud and sand, Aug. 25.

Off Hebron, 100 fathoms, mud, Aug. 25.

Off Fish Island, Hebron, 75 fathoms, Aug. 25.

Outside of Fish Island, Hebron, 80 fathoms, gravel, Aug. 25.

Halfway between Cape Mugford and Hebron, 60 fathoms, mud and sand, Aug. 23.

Port Manvers, 30 fathoms, sticky mud, Aug.

Twenty miles N. E. of Nain, Aug. 20.

Nain, 7 fathoms, mud, Aug. 18.

Shoal Tickle, 20 miles S. E. of Nain, 25 fathoms, Aug. 15.
Off Beachy Island, 80 fathoms, soft mud, Aug. 22.
Egg Harbor, 7 fathoms, mud, Aug. 6.
Off Egg Harbor, 20 fathoms, mud, Aug. 10.
Indian Harbor, Aug. 12.
Gready Harbor, 12–15 fathoms, rocky, Aug. 8.
"Cock Capelin," Gready Harbor, Aug. 8.
Bateau, Aug. 1.
One mile N. of Battle Harbor, 50 fathoms, fine sand, Sept. 14.
Off Cape Harrison, tow net, Aug. 13.

NEWFOUNDLAND

Cape Norman, May 1, 1906.
Brehat Bay.
St. Anthony, 2 fathoms, May 4, 14 and June 1, 1906.
Hare Bay, Jan. 20, 1906.
Conche, tide pools, Apr. 20 and May 17, 1906.
Pilley's Island, Dec. 11, 1905.
Port Saunders and Hawks Bay, July 12 and Aug. 1, 1906.
Seldom Come Bay, Fogo Island, July 28, and 29, 1908.
Funk Island, July 2, 1906.
Mouth of Serpentine River, July 1, 1905.
Off St. Lawrence Harbor, Placentia Bay, 59 and 53 fathoms, rocky, Sept. 29.
S. by E. of Burin, Placentia Bay, 100 to 110 fathoms, rocky, Sept. 28.
Off Cape Race, 30 fathoms, Sept. 26, 1908.

ST. PIERRE

St. Pierre Harbor, 5 fathoms, rocky, Oct. 1, 1908.
St. Pierre Bank, 30 fathoms, rocky, Oct. 2, 1908.
Off Crew Point, 17 fathoms, rocky, Sept. 29, 1908.

NOVA SCOTIA

75 miles W. N. W. of Sable Island, 75 fathoms, fine sand, Oct. 5, 1908.
Roseway Bank, E. of Cape Sable, 45 fathoms, gravel, Oct. 6.
75 miles E. of Cape Sable, 105 fathoms, mud, Oct. 6.
55 miles E. of Cape Sable, 85 fathoms, mud, Oct. 6.
14 miles S. of Cape Sable, 45 fathoms, rocky, Oct. 7.
20 miles E. S. E. of Cape Sable, 70 fathoms, fine sand, Oct. 7.
About 40 miles W. by S. of Cape Sable, 76 fathoms, black gravel, Oct. 8.
About 49 miles W. by S. of Cape Sable, 110 fathoms, gravel, Oct. 8.
Browns Bank off Cape Sable. 40 fathoms, rocky, Oct. 8.

SCAPHOPODA

Dentalium entalis stimpsoni Henderson. U. S.—S. of C. Sable, 76 f.; 43 miles W. by S. of C. Sable, 110 f.; Browns Bk., 40 f.

D. agile M. Sars. U. S.—55 miles E. of C. Sable, 85 f.; 75 miles E. of C. Sable, 105 f.

GASTEROPODA

Acmæa testudinalis (Müll.). LAB.—Egg Hbr., 7 f.; Gready Hbr., 12 f.; Buteau. N. F.—St. Anthony, 2 f. on *Pecten grandis;* Seldome Come Bay; Serpentine R.

A. rubella (Fab.). LAB.—Gready Hbr., 12 f.

Lepeta cæca (Müll). LAB.—Off Hebron, 60 f.; off Fish I., 80 f.; between C. Mugford and Hebron, 60 f.; off Egg Hbr., 20 f. Large *Hemithyris psittacea* Gmel. were taken at the latter Sta. N. F.—Off C. Race, 30 f. *H. psittacea* were also dredged at this Sta.; S. by E. of Burin, 110 f. N. S.—Browns Bk., 40 f.

Puncturella princeps (Migh. & Ads.). LAB.—Egg Hbr., 7 f.; Shoal Tickle. ST. PIERRE, 5 f.; N. S.—S. W. of C. Sable, 40 f.

Margarites helicina (Phipps). LAB.—Komaktorvik Bay, 5 f.; 20 miles N. E. of Nain; Gready Hbr., 14 f. N. F.—Conche.

M. umbilicalis var. *spiralis* Baker. LAB.—Komaktorvik Bay, 5 f.; off Fish I., 75 f.

M. olivacea Brown. LAB.—Between C. Mugford and Hebron, 60 f. Specimens vary in size from 4 to 9 mm. approaching the var. *gigantea* Leche; off Beachy I., 80 f.; Egg Hbr., 7 f.; Gready Hbr., 12 f.

M. groenlandica Gmel. LAB.—Nain, 7 f.; Egg Hbr., 7 f.; Gready Hbr., 12 f. N. F.—St. Anthony, 2 f. on *Pecten grandis* Sol.

M. groenlandica var. *incarnata* Couth. N. S.—Browns Bk. 40 f. S. W. of C. Sable, 40 f.

M. cinerea Couth. LAB.—Off Hebron, 60 f.; between C. Mugford and Hebron, 60 f.; Nain, 7 f.; Shoal Tickle; Egg Hbr., 7 to 20 f.; Gready Hbr., 12 f. N. F.—St. Lawrence Hbr., 50 f.

M. cinerea var. *maxima.* LAB.—Off Fish I., 75 f.

Solariella varicosa Migh. & Ads. LAB.—Between C. Mugford and Hebron, 60 f.; Shoal Tickle; off Egg Hbr., 7 to 20 f.; Gready Hbr., 15 f. N. of Battle Hbr. 50 f. N. F.—Off St. Lawrence Hbr., 50 f. N. S.—20 miles E. S. E. of C. Sable, 70 f.

S. varicosa var. *bella* Verk. N. S.—20 miles E. S. E. of C. Sable, 70 f.

Calliostoma occidentalis Beck. N. S.—40 miles W. by S. of C. Sable, 76 f.

Couthouyella striatula (Couth). N. S.—43 miles W. by S. of C. Sable, 110 f.

Odostomia (*Amaura*) *candida* (Möll). Lab.—Between C. Mugford and Hebron, 60 f.; Egg Hbr., 7 f.

Epitonium greenlandicum (Perry), N. S.—14 miles S. of C. Sable, 45 f.; S. W. of C. Sable, 40 f.; 43 miles W. by S. of C. Sable, 110 f.; Browns Bk., 40 f.

Natica clausa B. & S. Lab.—Port Manvers, 30 f.; off Beachy I., 80 f. N. F.—Off St. Lawrence Hbr., 50 f. N. S.—Browns Bk., 40 f.; 20 miles E. S. E. of C. Sable, 76 f.; 14 miles S. of C. Sable, 45 f. *Terebratulina septentrionalis* were abundant at this station, many being of a bright pink color.

Polinices heros (Say). N. F.—S. by E. of Burin, 100 f.

P. groenlandica Möll. N. S.—20 miles E. S. E. of C. Sable, 70 f.; 55 miles E. of C. Sable, 85 f.

P. immaculata Totten. N. S.—43 miles W. by S. of C. Sable, 110 f.

Amauropsis islandica Gmel. jur. Lab.—Off Beachy I., 80 f.

Velutina laevigata (Linné). Lab.—Shoal Tickle. N. S.—14 miles S. of C. Sable, 45 f.; 40 miles W. by S. of C. Sable, 76 f.; Browns Bk., 40 f.

V. undata Brown. Lab.—Between C. Mugford and Hebron, 60 f.

Marsenina glabra (Couth). Lab.—Shoal Tickle. N. S.—14 miles S. of C. Sable, 45 f.; S. W. of C. Sable, 40 f.; Browns Bk., 40 f.

Cingula areolata Stimp. N. S.—Browns Bk., 40 f.

C. carinata Migh. & Ads. N. S.—75 miles E. of C. Sable, 105 f.

C. castanea Möll. Lab.—20 miles N. E. of Nain; Shoal Tickle, 25 f. N. S.—Browns Bk., 40 f.

C. jan-mayeni Friele. N. S.—20 miles E. S. E. of C. Sable, 70 f.

Cingula bryanti, n. sp. nov. Shell dark reddish brown, narrowly umbilicated, whorls about five, apical and following whorl smooth, the others with two prominent spiral ridges, crossed by less prominent longitudinal costae, that form slight nodes at their junction with the revolving ridges, body whorl with three smaller spiral ridges below the two prominent peripheral ridges. The longitudinal costae conspicuous above the peripheral ridges, between them obsolete, but both ridges slightly nodose. Height 2.5, width 1.5 mm.

Two specimens, 15 fms. off St. Lawrence Harbor, Newfoundland, and one specimen 25 fms. Shoal Tickle, 20 miles S. E. of Nain, Labrador.

This species resembles in form the figure of *Alvania zetlandica*, Sars "Moll. Regionis Arcticae Norvegiae," Tab. 10, fig. 7, but with less prominent longitudinal costae. It also resembles *C. jan-mayeni*, but that is a larger and broader species, with only two sculptered whorls.

Onoba aculeus Gould. St. Pierre, 5 f.

Litorina littorea (Linné). N. F.—C. Narman, very large, some measuring 40 mm.; Hawkes Bay; Serpentine R.; Conche, tide pools; Seldome Come Bay; Pilley's I.

L. pallatia Say. N. F.—C. Norman; Seldome Come Bay; Pilley I.

L. rudis. Lab.—Nain, tide water; Indian Hbr. N. F.—Port Saunders; Funk I.; Pilley's I.: Conche, tide pools.

Lacuna vincta (Montg.). Lab.—Komatorvik Bay, 5 f.; Egg Hbr. 7 f.; Bateau. N. F.—Conche; Seldome Come Bay. St. Pierre.—5 f.; off Crew Point, 17 f.

Tachyrhynchus reticulatus (Migh. & Ads.). Lab.—Off Fish I., 80 f.; Shoal Tickle, 25 f.; Gready Hbr. 12 f.; off Hebron 60 f. N. F.—Off C. Race, 30 f.; S. by E. of Burin, 110 f. St. Pierre.—5 f. N. S.—Browns Bk. 40 f.; 14 miles S. of C. Sable, 45 f.

T. erosa Couth. Lab.—Komaktorvik Bay, 5 f.; off Hebron, 100 f.; off Fish I., 75 f.; between C. Mugford and Hebron, 60 f.; Port Manvers, 30 f.; Shoal Tickle, 25 f.; Egg Hbr., 7 f.; off Beachy I., 80 f.; 1 mile N. of Battle Hbr., 50 f. N. S.—20 miles E. S. E. of C. Sable, 70 f.; 43 miles W. by S. of C. Sable, 110 f.; 40 miles W. by S. of C. Sable, 75 f.; 55 miles E. of C. Sable, 85 f.; 75 miles E. of C. Sable, 105 f.

Turritellopsis acicula Stimp. Lab.—Egg Hbr., 7 f. N. S.—S. W. of C. Sable, 40 f.; 43 miles W. by S. of C. Sable, 110 f.; Browns Bk., 40 f.

Trichotropis borealis B. & S. Lab.—Between C. Mugford and Hebron, 60 f.; Shoal Tickle, 25 f.; off Egg Hbr., 7 and 20 f. N. S.—S. W. of C. Sable, 40 f.

Aporrhais occidentalis Beck. Lab.—Off Hebron, 60 f.; Egg Hbr., 7 and 20 f.; "Cock capelin," Gready Hbr. N. F.—Off St. Lawrence Hbr., 50 and 53 f.; S. by E. of Burin, 110 f.

Aporrhais occidentalis mainensis, n. var.

The specimens from the Gulf of Maine and Bay of Fundy differ from the typical form from the Gulf of St. Lawrence northward, in having fewer and more elevated longitudinal costae. The type calls for 25 costae, while those from the Gulf of Maine have only 14 on the penultimate whorl, the number being quite constant, while those from Labrador have from 22 to 25 costae. In the Gulf of Maine specimen the costae in the young end abruptly at the periphery and the peripheral line is

noticable on the entire body whorl to the tip of the wing-like lip, there is also a slight sub-peripheral line; both of these are obsolete or wanting in the more northern specimens. The variety is based chiefly on a large series dredged by Dr. C. W. Townsend in from 5 to 6 fms. near the Gillpatrick Ledge off Northeast Harbor, Maine. The figure by Gould represents this variety. It was found by Mr. Bryant 20 miles E. S. E. of Cape Sable, N. S., in 70 fms.

Trophon clathratus (Linné). Lab.—Shoal Tickle, 25 f.; off Egg Hbr., 7 f. N. F.—S. by E. of Burin, 100 f. N. S.—55 miles E. of C. Sable, 85 f.

T. clathratus var. *gunneri* Lovén). N. S.—Browns Bk., 40 f.

T. scalariformis Gould. Lab. — Shoal Tickle, 25 f.; off Beachy I., 80 f. Confused with *T. clathratus* but distinguished by its sharp elevated ribs with fine spiral lines in the interstices.

T. truncatus (Ström). Lab.—Shoal Tickle. 25 f.; Gready I., 12 f. N. S.—S. W. of C. Sable, 40 f.

Thais lapillus (Linné). N. F.—C. Norman, in earth above high water; Seldome Come Bay; mouth of Serpentine R.

Astyris rosacea (Gould). N. S.—Browns Bk., 40 f.; S. W. of C. Sable, 40 f.; 14 miles S. of C. Sable, 45 f.

A. holböllii (Möll.). Lab.—Shoal Tickle, 25 f. Distinguished from *A. rosacea* by its narrower form and prominent transverse ribs.

Alectrion (*Tritia*) *trivittata* (Say). St. Pierre.—5 f.

Buccinum cyaneum Brug. Lab.—Indian Hbr. N. F.—St. Anthony; Conche, tide pools.

B. donovani Gray. Lab.—Off Hebron, 60 f.; between C. Mugford and Hebron, 60 f.; Nain, 7 f.; Shoal Tickle, 25 ft.; Egg Hbr., 7 ft.; off Egg Hbr., 20 ft.; Gready Hbr., 12 f. N. F.—S. by E. of Burin, 110 f.

B. groenlandicum Mörch. Lab.—Between C. Mugford and Hebron, 60 f.

B. humphreysianum Bennett. Lab.—Between C. Mugford and Hebron, 60 f.

B. tenue Gray. N. S.—20 miles E. S. E. of C. Sable, 70 f.

B. tottenis Stimp. Lab.—Between C. Mugford and Hebron, 60 f. N. F.—Off St. Lawrence, 50 f.; S. by E. of Burin, 100 f.

B. undatum Linné. Lab.—Mettek I.; off Hebron, 60 f.; between C. Mugford and Hebron, 60 f.; Nain, 7 ft.; Egg Harbor, 20 f.; off Beach I., 80 f.; Bateau, Gready Hbr., 12 f. N. F.—C. Norman, St. Anthony. Conche. St. Pierre—5 f. (scalariform). N. S.—14 miles S. of C. Sable, 45, and 45 W. by S. of Cape Sable, 110 f.

B. undatum var. *striatum* Penn. Lab.—Off Hebron, 60 f.; off Fish I., 80 f.; Indian Hbr.

Plicifusus kroyeri (Möll.) (*Buccinum cretaceum* Reeve). Lab. —Off Egg Hbr., 20 f.

Beringius largillierti Petit. N. F.—Off St. Lawrence Hbr., 50 f.

Chrysodomus despectus var. *tornatus* (Gld.). Lab.—Off Fish I., 80 f.; between C. Mugford and Hebron, 60 f. N. F.—Off St. Lawrence Hbr., 50 f.

C. decemcostatus (Say). N. S.—Browns Bk., 40 f.; 20 miles E. S. E. of C. Sable, 70 f.

Colus islandicus (Linné). Lab.—Off Fish I., 75 f.; off Beachy I., 80 f.

C. stimpsonii (Mörch). N. S.—Browns Bk., 40 f.

(*To be continued.*)

EDWARD SYLVESTER MORSE

In the death of Professor Edward S. Morse, which occurred December 20, 1925, the world has lost a great naturalist. He was born in Portland, Maine, June 18, 1838, and from childhood was a close observer of nature. At the age of 13 he had made a noteworthy collection of shells, and in 1857, at the age of 19, he published his first paper, "Description of a new species of Helix" [*asteriscus*], Proc. Boston Soc. Nat. Hist., vol. 6, p. 138. In 1859, in the same publication, he described *H. milium.* In 1859 he became one of Professor Louis Agassiz's special students at the Museum of Comparative Zoology, where he continued his studies until 1862. In 1864 he published his "Observations on the Terrestrial Pulmonifera of Maine" (Jour. Portland Soc. Nat. Hist., vol. 1). Professor Morse made the remark one day that what induced him to make a study of the small land shells was a frequent statement of Prof. Agassiz: that you will not find a very small and a large species in the same genus. In this memorable paper careful anatomical studies of these minute mollusks proved this to be true, and led him to propose seven new genera for species previously referred to the genus *Helix.* His remarkable ability as an artist, which was early exhibited, enabled him to show the radulæ, jaws and other features illustrating these genera in a clear and most instructive manner.

In 1865 Professor Morse described several new species of Pupidæ (Ann. Lyc. Nat. Nist., N. Y., vol. 3, pp. 1–6) and in 1868 he became interested in founding the "American Naturalist," in vol. 1 of which appeared an interesting illustrated paper by him on the "Land Shells of New England." About this time he made the beautiful drawings that illustrated the Binney edition of Gould's "Invertebrata of Massachusetts."

Aside from Mollusca, Professor Morse was greatly interested in the Brachiopoda and was one of the first to prove that they were not Mollusca but belonged to the class Vermes. In his papers, "Early stages of Terebratulina septentrionalis" (1871), "Embryology of Terebratulina" (1873) and "Observations on Living Brachiopoda" (1902), the plates show some of his wonderful work as an artist. Ambidextrous, he could use either hand with equal skill, and could also draw with both hands simultaneously. In lecturing, his skill with a piece of chalk was marvelous. From memory, in an instant, with a few lines, he could draw the shell or object of which he was speaking, frequently drawing both sides at the same time, and occasionally, to the delight of his audience, he drew an animal by starting at the head with one hand and at the tail with the other.

In 1871 he became professor of comparative anatomy and zoology at Bowdoin College, remaining until 1874; he also gave a series of lectures at Harvard.

In 1875 appeared a most admirable text book for beginners, "First Book of Zoology," which the present-day teachers in "nature study" would do well to pattern after. In 1876 Professor Morse was elected a member of the National Academy of Sciences and the following year received the appointment of professor of zoology at the University of Tokyo, which he filled with great success, returning to America in 1880. While in Japan Professor Morse became greatly interested in the people, and in 1886 published "Japanese Homes and their Surroundings." His diary, kept at the time he was there, and published under the title "Day by Day in Japan," is a most interesting work and greatly appreciated by the Japanese themselves as showing the changes that have taken place in the country since

that time. Professor Morse also became intensely interested in the pottery of Japan and made a remarkable collection which he described and figured in a beautiful folio catalogue. The collection is now in the Boston Museum of Fine Arts. In 1898 the Emperor of Japan conferred on him the Order of the Rising Sun, he being the first American to receive that honor.

After his return from Japan Professor Morse became director of the Peabody Museum, Salem, Mass., building up a very interesting and attractive museum, with a most artistic and instructive oriental exhibit. He was elected president of the American Association for the Advancement of Science in 1886, American Association of Museums in 1911 and Boston Society of Natural History, 1915–1919.

In the later years of his life he wrote many papers bearing on New England Mollusca which were mostly published in the Proceedings of the Boston Society of Natural History and THE NAUTILUS. His last paper—"Shell-mounds and changes in the shells composing them," appeared in *Scientific Monthly*, vol. 31, p. 429–440, Oct., 1925. In all, Professor Morse published about 40 papers pertaining to Mollusca and 10 on the Brachiopoda.

On March 14, 1910, the Boston Malacological Club was organized and Professor Morse was chosen its first president. He always took a great interest and pride in the little club and for years attended quite regularly, giving at least one paper a year, his last paper in the fall of 1924.

Professor Morse leaves a son, Mr. John C. Morse, a daughter, Mrs. Russel Robb and four grandchildren.

In closing I cannot do better than quote a paragraph taken from an article by Dr. Wm. H. Dall in *Science*, Feb. 5, 1926, which expresses so well Professor Morse's personality: "The salient characteristic of Professor Morse, apart from his devotion to science and love of the beautiful in art, was his boyish enthusiasm which captivated all who knew him. The versatility of his interests was unbounded, his love of fun overflowed at every opportunity; to meet him was to find a welcome. The world was brighter for his presence."—C. W. JOHNSON.

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WILLIAM MARTIN BEAUCHAMP
1830–1925

William Martin Beauchamp was born at Coldenham, Orange County, New York, on March 25, 1830, the son of William Millett Beauchamp and Mary Jay Beauchamp. He died on December 13, 1925. The Beauchamp's came to this country from Somerset, England, in 1829. Their name of French origin had long been verbally anglicized—as its pronunciation "Beecham" bears witness.

The family moved to Skaneateles, New York, in 1831, when the younger William was slightly more than a year old. The father founded a local paper, the "Democrat," and maintained a circulating library as a private enterprise. It is not unlikely that easy access to many books as well as early contact with the printing business helped to shape the literary bent of the son. On the other hand, a stimulating environment, dominated by one of the most beautiful of the Finger Lakes, may well have contributed in no small degree to his love of nature.

William Beauchamp, as he was known to his contemporaries, received his early education at the Skaneateles Academy which he attended up to 1847. One may suspect, however, that those qualities which later bore fruit in scientific attainment were nurtured by lake, field and wood rather than by the formal secondary instruction of that period. For a number of years the young man was associated with his father in the publication of the "Democrat," but later he decided upon the ministry as a career, studying in the Delancey Divinity School at Hobart College. Made a deacon in 1862, he was ordained a priest of the Protestant Episcopal Church in 1863. From the rectorship of Calvary Church, Northville, New York, he went in 1865 to Grace Church at Baldwinsville, New York, remaining there until 1900. From 1900 he made his home in Syracuse. The greater part of his long life was therefore spent in Onondaga County of his native State.

Two institutions in central New York have signally recognized Doctor Beauchamp's activities. In 1886 Hobart conferred upon him the degree of S. T. D., while Syracuse University made

him an LL. D. in 1920. If one will consult the 1921 edition of "American Men of Science," these activities will be found to range from American history and local Colonial history through Iroquois language and folk-lore to archeology and the natural sciences!

Doctor Beauchamp has long been recognized, nationally and internationally, as an authority on the language, history and culture of the Iroquois. To readers of NAUTILUS he is perhaps best known for his "Land and Fresh Water Shells of Onondaga County, with a Supplemental List of New York Species." His interest in zoology, however, was not limited to work which reached the publication stage. His daughter, Grace Beauchamp Lodder (Mrs. J. S. Lodder), states that he has left manuscript notes on mollusks and on fishes.

Doctor Beauchamp reached a wide circle by his writings and his position as author and scientist is secure. To those who knew him personally, it is probably safe to say that Beauchamp the man made the strongest impress.

Short and wiry, with keen eyes and white beard, Beauchamp in clerical dress was a familiar figure at many scientific gatherings and natural history field excursions. With a wealth of anecdote, interesting or amusing, Beauchamp never lacked for hearers on such occasions. He seldom talked for long without a smile and a contagious geniality attracted men of the most diverse temperaments.

But Beauchamp's remarkable qualities were not confined to those of the heart and mind. He retained astounding physical activity in a ripe old age. The writer well remembers seeing Doctor Beauchamp at 75 climb a mean talus slope with the utmost agility. Behind him stumbled and puffed a group of undergraduates from one of our famous New England universities.

Beauchamp made the most of his environment. While others went far afield he stayed with his county's rocks, plants and shells. The written record of its white men was of interest, but probably the strongest incentive to research came from its aborigines. His investigations covered a wide range in history and in science and were largely carried on during a period when

he filled a responsible position as minister of the gospel. In old age a genial enthusiasm kept him young mentally and physically well into his 96th year.—Burnett Smith.

W. LEWIS MAY

One by one the older wiseheads pass away and we of the younger school, while we miss their valued advice, must realize we are growing older, and must take their place without their experience.

Tasmanian conchology without W. L. May appears incomprehensible, as for the last thirty years he has been sole arbiter. Gifted with clear judgment, a great collector, well read and methodical, his advice was ever sound; in addition he was a clever draughtsman and his "Illustrated Index" is a monument of real value.

Twenty-five years ago a "Revised Census of Tasmanian Shells" was issued under the names of Tate and May. The latter provided the majority of the material and the illustrations, while the former prepared the more technical matter. While this was passing through the press, Tate died, and since then May has continued the work alone. He was fortunately spared to complete his task, and in 1921 appeared the "Check List of the Shells of Tasmania," and in 1923 followed the "Illustrated Index," figuring every Tasmanian shell, the whole of the figures, over 1000 in number, being drawn by himself. This is the only complete illustrated account of the Mollusca of any State of Australia, and is being utilized daily in all the southern parts of Australia.

May was only sixty-four years of age and was taken seriously ill in the beginning of 1925 but recovered sufficiently to take a sea voyage through the islands. Passing through Sydney we proposed to monograph the Australian Marginellids, a group May was especially interested in. However the sea voyage came too late, and May only arrived back in Sydney on his death bed, passing away in this city on Aug. 30, 1925.

A member of the Society of Friends, May was very quiet, but never allowed his judgment to be influenced by anything

but facts, and consequently never made any enemies in any sense, being literally esteemed by every one who met him.—Tom Iredale, *Australian Museum, Sydney.*

SPIRULA SPIRULA (LINNE)

The following lines were suggested by a paper read by Mr. J. Henry Blake at the meeting of the Boston Malacological Club, October 6, 1925. They may possibly aid in calling the attention of many to the habits of this most interesting mollusk as described by Dr. Johs. Schmidt (Nature, vol. 110, p. 788, Dec. 9, 1922). Offered with apologies to the *Dana* Expedition.

The chambered shells of the Spirula,
As they float upon the sea,
Are cast on a thousand beaches
For any one to see;
But the animal that made this shell
Was long a mystery.

Linné called it *Nautilus spirula*
Which was not a very bad guess.
Lamarck called it *Spirula peroni*
(Though he'd first named it *fragilis*);
And thus quite early was started
A nomenclatorial mess.

Some said with that disk-like sucker
Attached it must surely grow,
While the rudimentary fins would prove
As a swimmer it must have been slow;
Then the chromatophores would indicate
That it lived in the mud, you know.

'T was the *Dana* Expedition
That discovered Spirula's home
Far above the oozy bottom
And below the great waves' comb;
For bathypelagic is the Spirula
And there's where it loves to roam.

It only lives in the warmer seas,
At more than a thousand feet,
Suspended head down in the water
A position hard to beat—
Though doubtless it is its chambered shell
That aids it in this feat.

And now they say that the "sucking disk"
Is really a lamp instead,
And perhaps its lighter color is due
To its standing on its head;
But, alas! poor little Spirula
Can't rest in the ocean's bed.

—C. W. Johnson.

PUBLICATIONS RECEIVED

Tertiary Fossils Dredged off the Northeastern Coast of North America. By Wm. H. Dall (Amer. Journ. Sci., vol. 10, pp. 213–218, Sept., 1925). The fossils referred to were obtained from small masses of rock taken by trawls on the fishing banks. These prove with little doubt that late Cretaceous and Tertiary deposits originally existed along the northeastern coast from Newfoundland southward. Gay Head, Marthas Vineyard, Mass., is the most northeastern locality where Tertiary fossils in undisturbed position are found.—C. W. J.

Anatomy of Hendersonia: a Primitive Helicinid Mollusk. By H. B. Baker (Proc. Acad. Nat. Sci. Phila., vol. 77, pp. 273–353, 1925). Based on its paucispiral operculum and its radula, *Hendersonia occulta rubella* is considered by the author to be the most primitive living example of the family, except, perhaps, the well-known genus *Bourciera* from Ecuador. The anatomy is shown on four plates.

The Mollusca Collected by the University of Michigan—Williamson Expedition in Venezuela. By H. B. Baker (Occas. papers Mus. Zool., Univ. Mich., No. 167, 49 pp. Feb., 1926). This is the third paper on the Mollusks of this region. It treats chiefly of the families Helicidae, Acavidae and Bulimulidae. The anatomy and radula of the species are shown on four plates.

Materials for a revision of the Recent Indian Limnæidæ. By the late N. Annandale and H. S. Rao (Rec. Indian Museum, vol. 27, part 3, 1925). This paper is provided with a key for

the determination of species, figures of the shells, teeth and genitalia, and apparently will be very useful for all interested in the group. The species are grouped under the four subgenera: *Limnæa*,[1] *Radix*, *Galba* and *Pseudosuccinea*. The last is used for the group of *L. acuminata*, we are inclined to think incorrectly. The treatment of species seems to be commendably conservative; the wide range of variation being provided for in numerous named "forms" which are defined in comparative terms and figured. The authors failed to find characters more important than specific in the genitalia, teeth and jaws.—H. A. P.

NOTES AND NEWS

HEMPHILLIA MALONEI Van. In correspondence lately with Mr. Walter J. Eyerdam, of Seattle, Wash., I mentioned a black Hemphillia which I had taken and asked him if he had heard of one. He states that it is evidently the above species, which was described from specimens taken on Mt. Hood.

On July 2, 1916, I took a pair under a log on the border of a good-sized lake, on Mt. Brenton, Vancouver Island, at an elevation of between 3500 and 4000 ft. They were entirely black in color, and much larger than any *H. glandulosa* I have met with; the shelly plate is also twice the size.

At the elevation where found the ground was still covered with snow and the lake still largely icebound, and the only place where the snow had gone was a small area by the outlet. But for these conditions more specimens might have been taken. When I arrived home late on the following day, very little of either slug remained except the shelly plate. The species would appear to be an Alpine one.

It is a number of years since I took any *H. glandulosa;* they were found during the winter among dead leaves in small thickets along the banks of the Cowichan River, long since washed away during freshets. The late Rev. G. W. Taylor wrote me in 1909 that he had found the species on fronds of *Aspidium*

[1] The spelling *Limnæa* is preferred as "the best known form."

munitum in the autumn, near the Nanaimo River on the island. As it was not on his first list, I do not think that he took it elsewhere.—A. W. Hanham, Duncan, Vancouver Island.

Turbonilla hypocurta. In proposing a new name, *Turbonilla* (*Babella*) *cælatior* (Proc. U. S. Nat. Mus., vol. 30, 1906, p. 347) for *Parthenia cælata* A. Adams, 1863, not *Turbonilla cælata* Gould, 1861, nor *Chemnitzia cælata* Carpenter, 1865; the authors, Dall & Bartsch, add, referring to Carpenter's species, "which may be called *hypocurta*."

In 1909 the same authors (Bull. U. S. Nat. Mus., No. 68, p. 78) again propose a new name, *Turbonilla* (*Pyrgiscus*) *favilla*, for *Chemnitzia cælata* Carpenter. Of course the latter name, under the rules of nomenclature, will have to pass into synonymy, and this shell must be known by the first name, *Turbonilla* (*Pyrgiscus*) *hypocurta* Dall & Bartsch.—Fred Baker.

Leptinaria.—Dr. Pilsbry has just called my attention to the fact that my name, *Leptinaria perforata* (Proc. Acad. Nat. Sci., Philadelphia, Dec., 1913, p. 645), is preoccupied by Pfeiffer, as noted in the Manual of Conchology, Ser. 2, Vol. 18, p. 302, with full references and synonymy. I therefore propose that the species be known as *Leptinaria mamorcënsis*, as the only specimens of the species were taken by me on the Brazilian side of the Mamoré River in the State of Matto Grosso.—Fred. Baker, Point Loma, Cal.

Subulina parana Pils., described from Pará, was taken by Professor Cockerell at Rio de Janeiro during his stop there in 1925. It is easily distinguished from the common *S. octona* by the fine striation. *Leptinaria lamellata* P. & M. also was taken there. The variety *concentrica* Reeve was already known from southern Brazil.—H. A. P.

Pupoidopsis hawaiensis on Christmas Island.—In the Annual Report of the Director of the B. P. B. Museum, Honolulu, for 1924, p. 12, Dr. C. Montague Cooke records the finding of this species in large numbers by Mr. Dranga. It has been known only from Oahu, Molokai and Maui hitherto.

We are deeply grieved to record the death of James H. Ferriss on March 17, at his home in Joliet, Illinois.

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